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VOLUME XII MARCH 26, 1923 NUMBER 7

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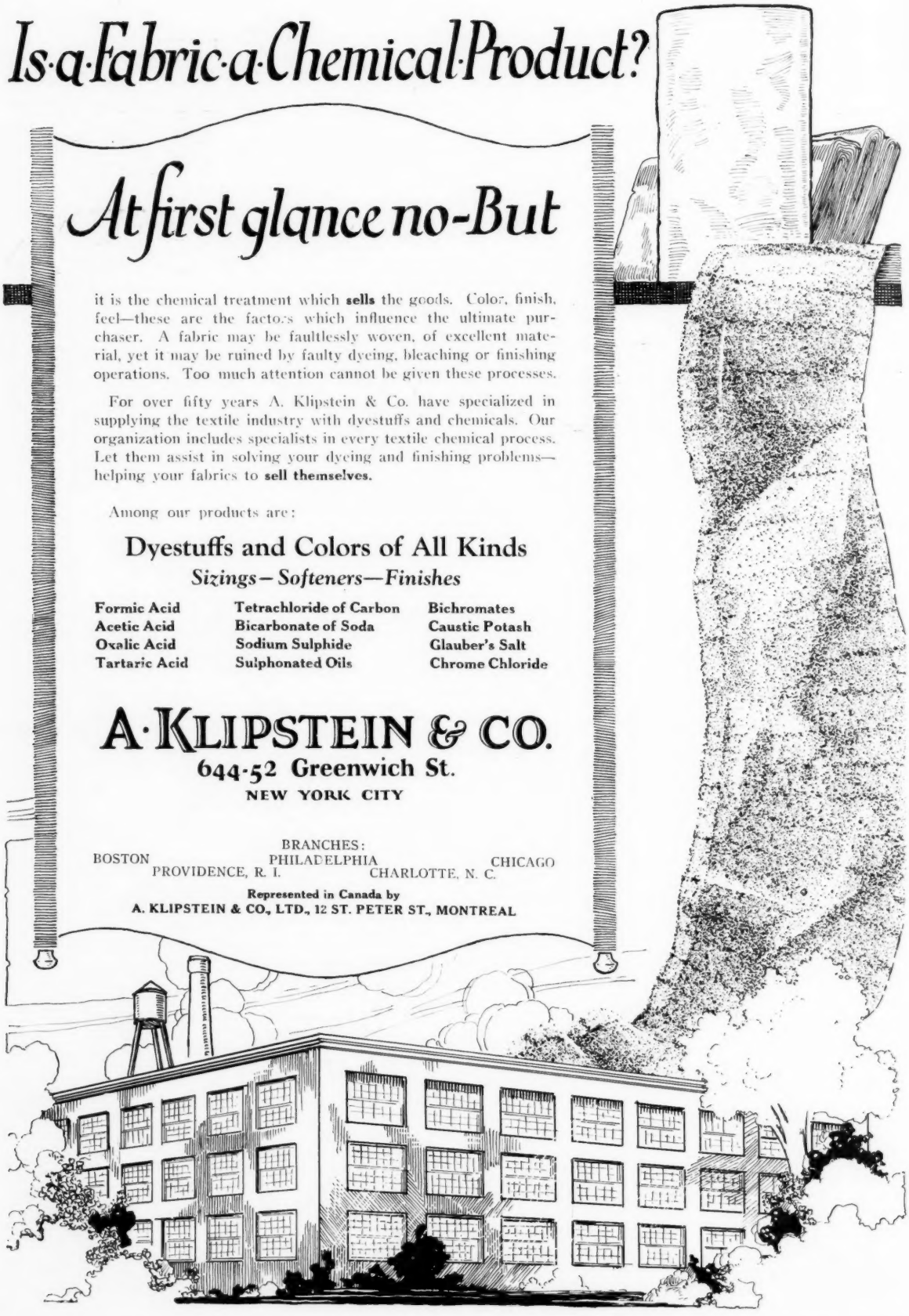

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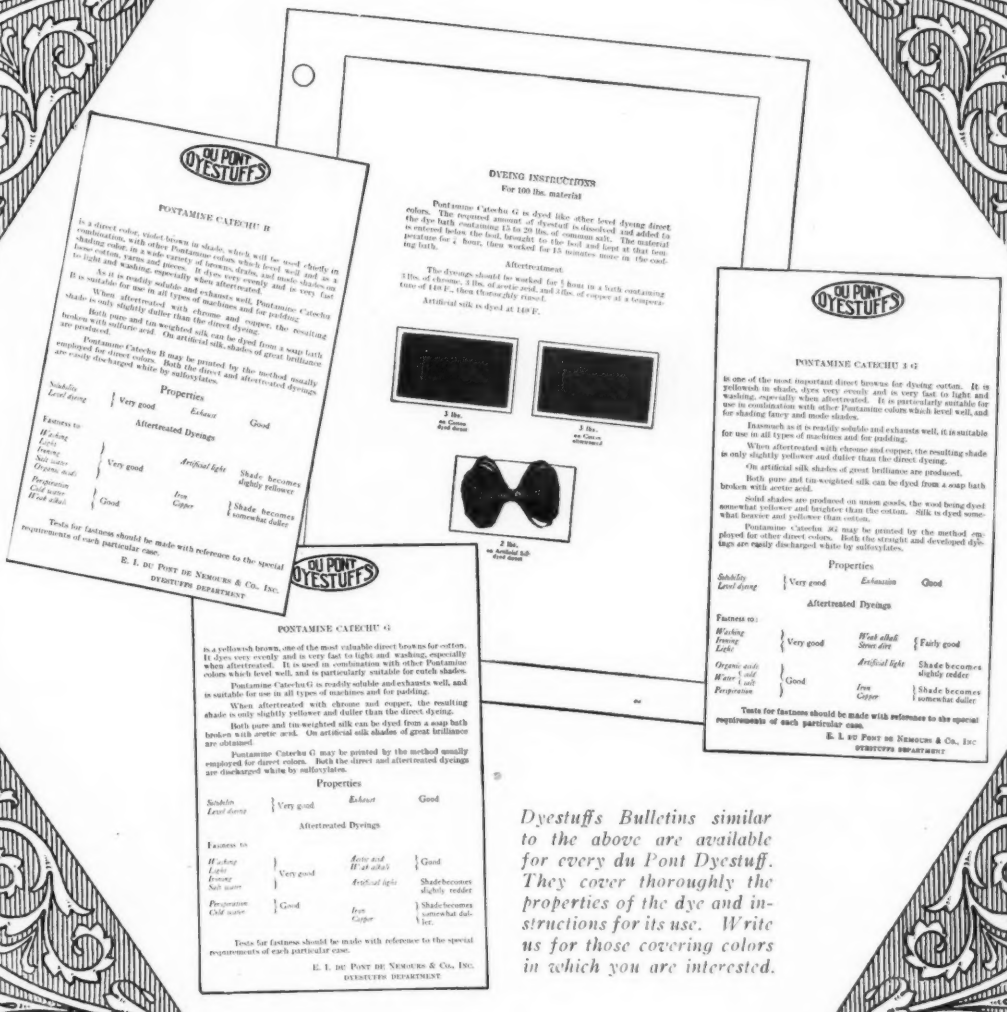
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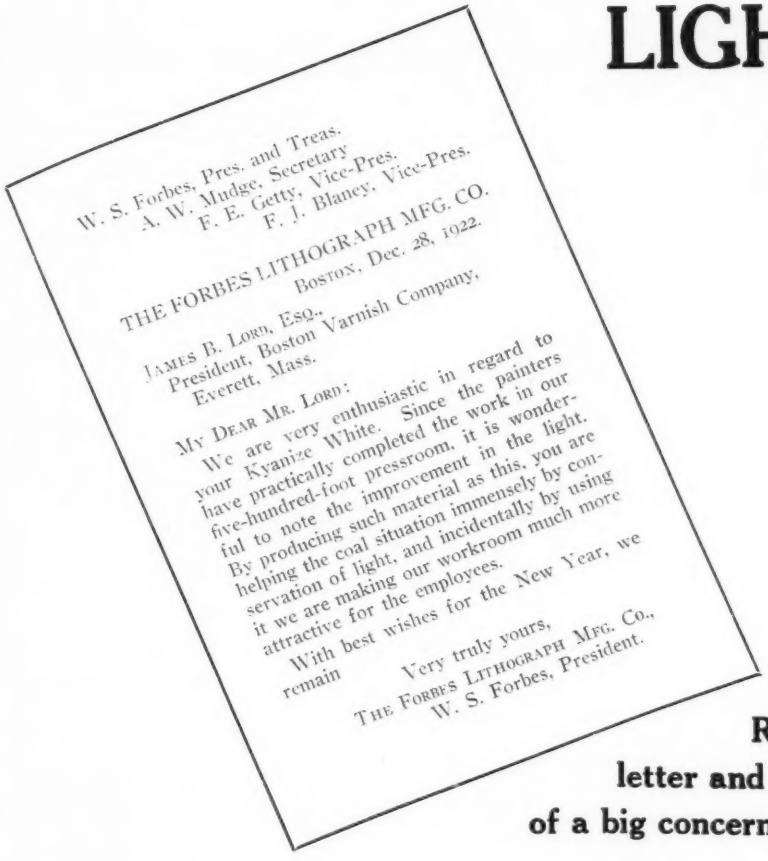

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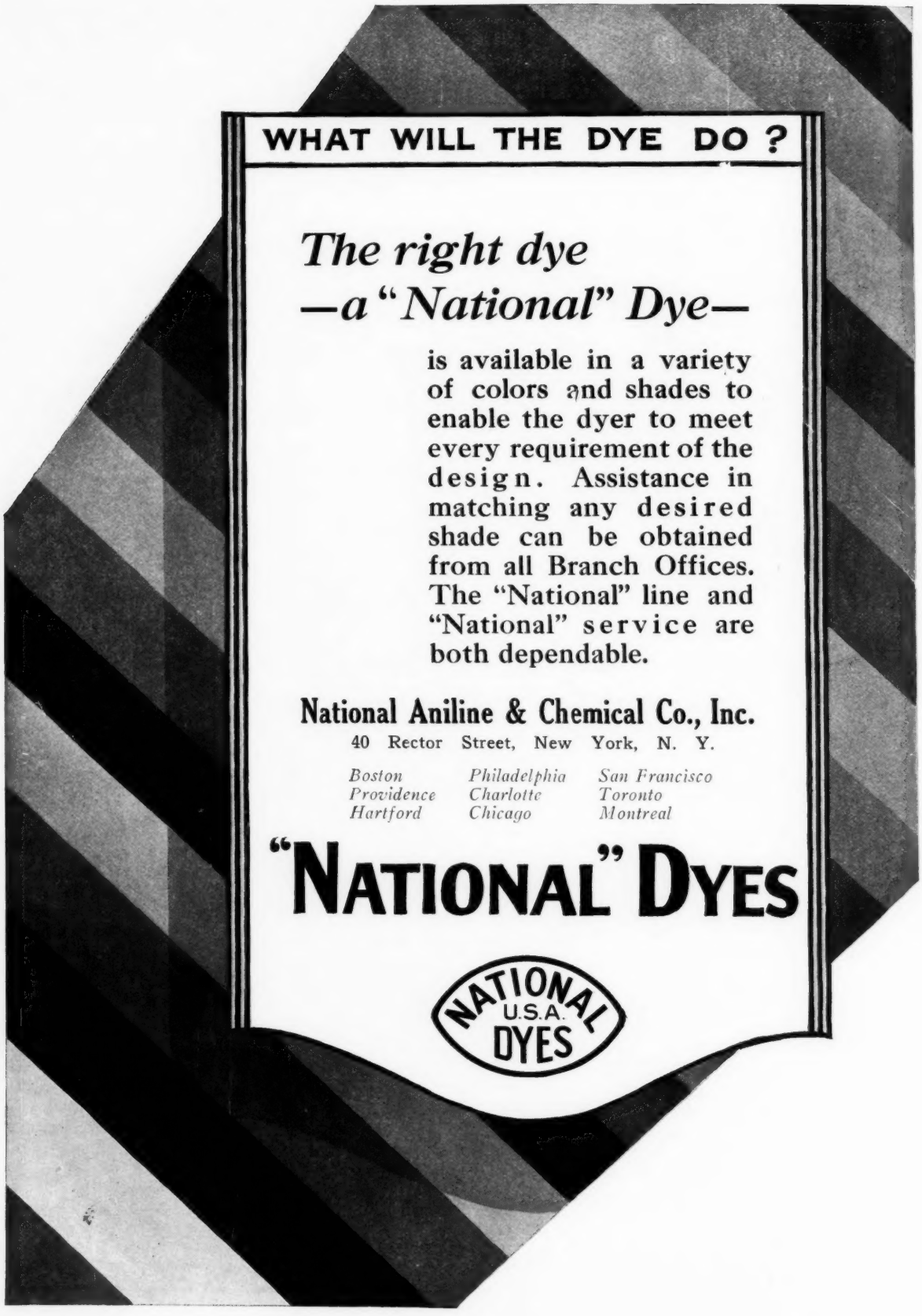
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VOLUME XII | NEW YORK, MARCH 26, 1923 | NUMBER 7

The Dyeing of Wool

(In Two Parts)

Part II—Dyeing Operations

Classes of Dyestuffs Used—Raw Stock—Yarn Dyeing—Piece Goods

By GEORGE H. JOHNSON, B.T.C.

THERE are a number of classes of dyestuffs which are used in the dyeing of wool. They may be grouped under six headings:

1. Acid colors.
2. Chrome bottom colors.
3. Meta-chrome colors.
4. Top chrome colors.
5. Direct cotton colors which dye wool.
6. Neutral colors.

The basics are seldom applied to wool, except possibly in the shoddy trade, because of their very poor fastness to light and crocking, and also because the dyer is able to produce almost any desired shade with his faster acid colors. The Rhodamines and Eosines are occasionally used for delicate pinks which cannot be produced with the available acid colors.

To go into the numerous details of dyeing these classes upon wool would be superfluous, since every dyer and textile chemist is perfectly familiar with each process.

Raw Stock

Raw stock is dyed either in open hand tubs or in specially constructed dyeing machines. These machines are of two types. In one type the stock is stationary and the liquor is forced through it; in the other the stock revolves in the liquor. A Hussong dyeing machine is an example of the first type, a Klauder-Weldon of the second. But regardless of what kind of tub or machine is used for dyeing, there are certain essentials which apply to all. Clean wool is absolutely necessary if good results are to be obtained. When using acid colors the shades are brighter, bloomier and more even. With chrome colors this cleanliness is of especial importance, for unless the wool grease is completely removed there is ever the danger of crocking, to say nothing of dulling and less lively shades. The especial requirements for loose wool, slubbing, tops, etc., are, as a rule, fastness to light, milling and steaming. Occasionally acid colors are used for raw stock dyeing because of the need of producing special bright shades not to be obtained with chrome colors. Although there are a few acid colors which will withstand a moderate milling, it is well to remember that fastness to milling and washing is not at all times satisfactory.

Dyers, for the most part, produce fast light and medium shades on wool, according to the monochrome or metachrome method. This process of dyeing is of great advantage, because the dyer can watch his batches come up to shade and control them far better than if the top-chrome method were used, and with less time and cost than if the wool were dyed on chrome bottom. Special patented mordants are used, although many dyers prefer to start the dyeing with about one-half as much bichromate of soda as of color, adding at the same time one-quarter to one-half per cent ammonium sulphate. The latter compound must be neutral or, better still, slightly alkaline. Usually the commercial variety is slightly acidic, in which case the dyer should counteract the acid with enough ammonia to throw the bath over slightly on the alkaline side. Naturally, the dyestuff and mordant are dissolved and added to kettle separately. The importance of the boil when using meta-chrome colors cannot be overemphasized. After coming to the boil, keep at that temperature until the bath appears exhausted, and

then continue boiling for about one hour longer. This insures the complete fixation of the dyestuff. Although the bath will generally appear exhausted earlier in the process, it is unwise to wash off, as an insufficient or too gentle boil causes incomplete development of color and consequently results in diminished fastness to milling.

The top-chrome process of dyeing is, as a rule, employed for such full shades as browns, navies, blacks, greens and maroons, because the fixation of the color in the fiber is excellent; meaning, of course, faster colors. Raw stock is seldom dyed on a chrome bottom unless it is impossible to obtain satisfactory results by the other two methods. It is to be recommended, however, if mixed stock is used or if the wool contains a small amount of greasy matter. Chroming at a boil not only mordants the wool but often cleans it as well. This method may be used to advantage in the dyeing of shoddy which has previously been stripped and at the same time mordanted in a bath of 3 to 10 per cent bichrome and 3 to 7 per cent sulphuric acid. After mordanting, it is essential to wash the stock thoroughly or crocking will be the result after dyeing. A loosely fixed mordant means a loosely fixed color lake.

When dyeing on a chrome bottom, if the greatest fastness to milling is desired care must be taken that the wool is clean, that it is not boiled too long, and that excessive quantities of bichrome and mordanting assistants, such as vitriol, argols, lactic acid, etc., are not used. If the mordanting bath is not watched closely there is a tendency for the so-called "overchroming," which not only causes a loss of color but tend to injure the wool as well. If the boil is carried on too rapidly and in too short a bath uneven mordanting is the result and will cause uneven dyeings. It is well to control boiling of raw stock for other reasons. If boiled too hard or too long, especially in machine dyeing, the fibers tend to mat or felt. This affects the strength of the wool and is apt to cause trouble in the card room after drying.

When dyeing to shade, it is sometimes necessary to feed on after the bath has been exhausted. If the batch is badly offshade it is advisable to use the same dyestuffs as were used at the start of the operation. If, however, the shade needs nothing but a slight toning a number of acid colors are suitable because of their high tinctorial power and satisfactory fastness to milling: Cloth Red B, 2R, G; Acid Violet 4BS; Fast Acid Green B; Patent Blue A or V. These dyestuffs, well diluted, are often added directly to the boiling bath, although it is advisable to cool down as for chrome colors.

Yarn Dyeing

There is little doubt but that the chrome-bottom method of dyeing is ideal if quality is the consideration. If production is the main consideration, the chrome and top-chrome methods are advisable. One more point in regard to machine dyeing: the solubility of every dyestuff to be used in machine dyeing must be of the best.

As for all other classes of woolens, the dyestuffs employed for the production of the required shades on yarn depend a great deal upon the fastness requirements which the dyed yarn must meet. Weaving yarns which are to be woven into fabrics and subsequently milled require the fastness demanded of loose wool, slubbing and tops; namely, excellent fastness to light, milling and steaming. Sweater yarns demand especially fastness to light and to rubbing. Yarns for bathing suits must be able to withstand sunlight, salt water and rubbing. Hosiery yarns must be fast to washing, perspiration and crocking. Yarns for the carpet, tapestry and furniture-covering trades also must withstand light and rubbing. Occasionally a shade is demanded on yarn which must be fast to stoving.

The first essential in yarn dyeing is a scoured yarn free from oils and soap. This is required if level dyeings of good fastness to rubbing are to be expected. In a number of instances, for pale delicate tints, the yarn must be previously bleached before dyeing, as is true to quite an extent in carpet dyeing.

When dyeing with acid colors, a large number are available. It is quite possible to dye such colors reasonably fast to light in deep full shades. Even if the dyestuffs used are but moderately fast to light, due to the heavy percentage of color deposited on the fiber, the results obtained are satisfactory, whereas in a light shade or delicate tint they would prove unsatisfactory. When dyeing medium shades, if the dyer uses judgment in his selection of colors a reasonable fastness may also be obtained. When he has a number of the light and bright shades so often demanded, he faces a different proposition; for acid colors fast to light in pale shades are by no means numerous. In many instances the shades demanded require the use of colors known to be but moderately fast to light, in which case the dyer cannot be held responsible if the shades fail to stand up as long as the consumer had expected.

In the actual dyeing process care must be taken that the colors used are dissolved properly; that the bath is not started at too high a temperature nor the boil reached too quickly. Level dyeing colors are used and generally require sulphuric acid for the exhaustion of the bath. Many dyers prefer using niter cake (sodium acid sulphate) because of its slower action in the dye bath. Glauber salt, of course, is used as a leveling agent, either in the crystalline or calcined form: 100 parts crystals equals 44 parts calcined Glauber salt; 100 parts calcined equals 227 parts crystalline Glauber salt. When it comes to shading, only the most level dyeing colors should be used; namely, those which go on the fiber evenly at the boil. The following are a number of acid dyestuffs possessing excellent fastness to light, and which are extremely level dyeing: Fast Light Yellow 3G; Tartrazine; Wool Orange GG, cryst.; Amido Naphthol Red G; Alizarine Sapphirol B; Patent Blue V and A (moderately fast to light, but extremely level dyeing); Wool Green S.

Occasionally the trade demands bright pinks which

cannot be obtained with acid colors, in which case Rhodamine is generally used. This dyestuff is applied to wool in a slightly acid bath with the addition of a very good grade of Glauber salt. The dyeing takes place at or near the boil, the bath exhausting quite well. Usually bleached wool is employed, but often the wool is stoved after dyeing, a process which seems to produce shades faster to light than if the yarn were bleached previous to dyeing. For best results soft water should be used. Often acid scarlets may be brightened with Rhodamine. When especially delicate tints of pink are desired, the yarn is sometimes dyed in a bath containing a small amount of soap (say, ¾ ounce to the yellow) and soda ash. This takes place at a lukewarm temperature. The yarn is then hydroextracted, stoved and rinsed thoroughly.

When worsted and woolen yarns must be dyed with colors of the highest degree of fastness, meta-chrome, top-chrome and bottom-chrome colors are used. When dyeing yarns with the chromate method, it has been recommended to boil the batch for half an hour or so with about two-thirds of the required amount of mordant. The bath is afterward neutralized with ammonia if acid and the remainder of the mordant are added together with the dyestuff. The dyeing is then conducted in the usual manner. If acid colors have been dyed in a kettle previous to dyeing a batch with chromate colors, it is best to boil out the kettle with water containing a little bichrome, which removes the acid from the wood. Boiling out with ammonia or soda has been found to be less effective. If top-chrome colors are used the bath must be completely exhausted before the bichrome is added. If this is overlooked shades are produced which are not as fast to rubbing as they should be. The chrome-bottom method is used for producing shades difficult to dye either with chromate or top-chrome dyestuffs.

If it becomes necessary to shade, the bath should be cooled down to about 120 deg. Fahr. and the same colors used as at the start if the batch is far offshade. The color must be well diluted before being added and carefully sieved. Raise the temperature slowly to the boil, and boil half an hour. When shading top-chrome colors, if large amounts have to be added it is advisable to fix the color afterward with bichrome. If the shade is not too far off, acid colors fast to milling may be used, of which those given under the heading "Raw Stock" are examples. If no special fastnes to milling is required, use the same level-dyeing colors as are suitable for shading acid colors at a boil. These possess sudcient fastness to light to be entirely satisfactory.

Piece Goods

The dyeing of woolen and worsted piece goods is probably the most important of all classes of textile dyeing, and calls for the greatest of skill and technical knowledge. There are so many details and steps required in the production of a perfect piece of cloth—details which if overlooked will spoil the goods—that the best of supervision is required.

The mill management may cause trouble for the dyer even as far back in manufacturing as the operation of making up a mix. If the dyer is told of the existence of a certain mix he is more or less prepared for the proposition when the goods come to him from the washhouse. But when, after dyeing hundreds of pieces of a certain style of fabric satisfactorily, a number of pieces made of a new mix reach the dyehouse, the change being unknown to the dyer, surely if the pieces are spoiled he cannot be blamed if he refuses to take the responsibility for the results obtained. When one considers the many different varieties of wool, to say nothing of noils, shoddies and pulled wools, it is certainly not too much to assert that the dyer cannot be held responsible for unsatisfactory results arising from such a cause as we have just named.

The use of a poor grade of spinning oil may also cause a great deal of trouble for the dyer. After the raw wool has been scoured it is not in a condition to be spun or woven conveniently. Wool fibers are of a scaly nature and tend to interlock with one another, a fact which if not controlled prevents the production of a perfect woolen thread. In order to prevent the occurrence of this interlocking as much as possible, the wool is oiled, the oil used depending on cost and the operations to which the wool is to be subjected after spinning or weaving. The oil first used for this purpose was olive oil, but due to the expense cheaper oils were substituted. Blends of various oils have been made up and sold under the name of wool oils. These usually consist of various mixtures of fatty oils, olives and hydrocarbon oils. If the proportion of the last-named oils is not too great these blends often prove satisfactory. The cheapest oils, of course, are the mineral or hydrocarbon oils obtained from such sources as petroleum and rosin by a number of processes.

If lubrication were the essential element desired, almost any oil would serve the purpose; but other factors must be taken into consideration. Before the yarn or cloth can be dyed and finished, all wool oils, sizing materials and accumulated dirt picked up during the process of manufacturing must be removed. This is done most commonly in a scouring bath of soap with or without the use of soda, although there are a few naphtha extraction plants in operation. In scouring there is a dual action upon the fiber: first, the emulsifying power of soap solutions on oil, and, second, the saponifying action of soda on the fatty oils. With certain classes of goods where the oil content is known, soda alone may be used in the scouring bath. With a good grade of oil this emulsification and saponification prove satisfactory; but, unfortunately, mineral oils, if used, are not saponifiable, and hence are difficult to remove. Furthermore, if they are not removed cloudy and streaky goods are bound to occur in the dyehouse. Many mills, of course, use mineral oils for cheapness, but it would be interesting to know for an absolute fact whether the money saved on oils is more or less than that spent in solving troubles which occur in scouring and dyeing, and which may later be traced to the use of these so-called cheap mineral oils.

In the washhouse, if the work is not well supervised goods may be sent to the dyehouse when they are not really in fit condition to be dyed. It is for this reason that many piece-goods dyers give their sets a precautionary run in ammonia at 110 deg. Fahr. for half an hour. If the pieces have not been properly cleaned one may rest assured that the dyed goods will show the effects upon being examined at the rough perch. As stated before, all wool oils must be washed out, together with any dirt present. If the warp sizing has not been removed during wet finishing, streaky effects will show up after dyeing. During the rinse all soap used in the scouring liquor also must be washed out, or the danger of the fatty acid being "set" by a mineral acid in carbonizing or in dyeing is imminent. The results are obvious.

The fulling or milling operation, likewise, will cause dyeing troubles if misgoverned. As a rule, a strong alkaline soap is used, and in many instances certain parts of a piece of cloth receive a different treatment in the fulling mills than other portions of the same piece. Hence we get a difference in felting action which will show up later in clouds. The washing of the goods after fulling naturally must be complete. While a number of authorities have pointed out and written numerous articles on the value of using soft water in the washhouse, it may well be mentioned again here. In fact, this paper would be incomplete were this truth not mentioned. Soft water should be used in the manufacture of worsted and woolen piece goods. Every finisher and dyer knows why.

There is another department wherein poor work will influence the dyeing of piece goods, and that is the carbonizing. Depending a great deal upon the mill and class of goods being manufactured, burrs and vegetable specks are carbonized before or after dyeing. In some mills, however, the pieces are speck-dyed instead. If carbonized before dyeing, great care must be taken. The pieces should be saturated uniformly with the acid, after which they should be squeezed evenly. When a continuous machine is used and the pieces are sent into the drying oven directly from the saturation tank, special note should be taken of the ventilation. This is very important, for unless controlled there is danger of drops of water condensing and falling on the goods, forming dark stains and sometimes causing holes to appear in the piece. Ventilation is not so important in the baking oven. After the goods have been carbonized they are "broken" in a dry fulling mill, generally neutralized in the washhouse and sent to the dyehouse. Sometimes the pieces are sent directly to the dyer, who neutralizes the acid held in the fibers in his dye kettles. Ammonia or soda is used, the temperature of the bath being raised to 110 deg. Fahr. and a half-hour run being sufficient to neutralize any acid present. If the pieces are still hot from the baking oven they should be run in cold water for some time before any alkali is added. The neutralizing action of alkali upon acid is a heat reaction, and if the goods themselves are hot there is danger of the wool fiber being affected. In a number of mills carbonizing takes place after dyeing, the goods being neutralized as before. However, one must bear in mind that dyestuffs fast to carbonizing are somewhat limited. Every dyestuff will not withstand such a drastic acid treatment.

From the foregoing paragraphs it is plain to see that long before a set of pieces reaches the dyehouse events may occur over which the dyer has no control. It is really the duty of every overseer of a department through which the goods must pass before being dyed to co-operate one with the other. An efficient superintendent must be in control. No dyer under the sun is able to produce satisfactory results day after day if goods are sent to him in unsatisfactory condition for dyeing.

It is difficult to prescribe any definite procedure for dyeing piece goods, because, style by style and fabric by fabric, methods vary somewhat. A closely woven worsted fabric such as a worsted crepe and an open-weave fabric such as a homespun certainly cannot be dyed by one and the same method. The general principles of dyeing may be the same for each, but the treatment will be different. Men's suitings, worsted coatings and uniform cloths, of course, demand exceptional fastness, especially to light, dust, steaming, rubbing, perspiration, washing and, when a close finish is not desired, fastness to milling. Ladies' dress goods demand good fastness to light, perspiration, street dust and rubbing. Flannels, for the most part, demand clear shades, generally bright, of reasonable fastness to light and occasionally fastness to washing. Velvets and plushes, generally consisting of a colored cotton warp and a filling which is later crossdyed, require fastness to light and to rubbing. And so one might go on.

As in yarn dyeing, whether top-chrome, chromate or chrome-bottom colors are used depends much on the shade desired and the fabric being handled. For light and mode shades, when the dyer wishes to watch his batches come up to shade the meta-chrome process has its advantages. For navies, browns and blacks, top-chrome colors are used successfully. When it is difficult to dye certain shades satisfactorily by any other method, or if quality is desired, the dyeing is done on a chrome bottom. This is especially valuable for fabrics made up of blends otherwise difficult to dye. Often men's wear fabrics contain a resisted colored silk thread effect or white silk or mercerized cotton which it is desired to leave unstained. Top-chrome colors are used, the method remaining unchanged except for the addition of an increased amount of acetic acid. Formic or sulphuric acid cannot be substituted for acetic in this case.

However, whether the dyeing of piece goods is done with chrome or acid colors, certain fundamentals are the same in either case. First and foremost, Glauber

salt should not be poured into the kettles but should first be placed in strong cotton bags whose open ends are tied securely with strong rope. In this way the bag holds back all such foreign matter as bits of wood, nails and dirt which might possibly tear the pieces or contaminate the dye bath. The bags should be tied securely, one at each end of the kettle but clear of the steam pipes. Often the bath is heated to 110 deg. Fahr. in order to insure the complete solution of the Glauber salt.

Too much stress cannot be laid on the proper and careful dissolving of dyestuffs. Regardless of time or any other consideration, color should never be added to a piece-dye kettle until the solution has been sieved properly. The kettle hands must be closely supervised when adding vitriol or any other acid to the dye bath, even when the bath is cold. They should never be allowed to become careless in the matter and spatter the acid on the goods.

At times when acid colors are being used, unneutralized carbonized pieces are thrown into the dye kettles, Glauber salt and color added, and the dyeing commenced in the usual way. Such a practice may be perfectly satisfactory for blacks and certain other shades which are known to be level dyeing, but is certainly not to be recommended as a general rule, especially if any of the difficult mode shades are to be dyed. The pieces should run at least ten minutes in the dye liquor before the operator turns on the steam. This allows the liquor to penetrate well into the fiber. A uniform distribution of steam is highly essential for satisfactory work. After the batch has boiled the required length of time it is sampled and, if necessary, shading colors are added. (Note—See list on page 236 for suitable colors.) This is a point at which many acid-dyed pieces are spoiled. The steam should be turned off at once and the well-diluted color carefully sieved. The operator must distribute the solution evenly at the back of the kettle and must not allow any of the concentrated liquor to spatter on the hot pieces. After the color has been added, allow the kettle to continue running five to ten minutes without steam, then bring to a boil and boil half an hour longer. If the batch is then up to shade the goods are rinsed.

Unless the rinse is carefully controlled, mill wrinkles may develop or clouds and streaks may result. With most light-weight ladies' dress goods there usually is but little danger of spoiling a set at this point, but through carelessness it sometimes happens. With heavy-weight fabrics which are dyed with acid colors, troubles such as the above occur all too frequently. When washing off, warm water should be used first until the bath gradually becomes hand-warm. After that cold water should be used until the bath is absolutely clean and the pieces are cold. If pieces are taken out of kettles while still warm, clouds frequently develop. If cold water alone is available for rinsing, great care must be taken that none of it strikes the boiling-hot pieces directly. Many a piece of cloth, perfectly dyed, has been spoiled by careless rinsing.

A well-known dyeing trick which has solved many a difficult problem of obtaining level dyeings is to use an old standing liquor. Oftentimes a few pieces of cloth which are later to be dyed black are dyed up a shade similar to that required on the regular set. These pieces, after the bath is exhausted, are run out of the kettle and washed in another machine. The old dye liquor is consequently saved. The regular batch is then thrown into the kettle, the necessary amounts of Glauber salt, acid and dyestuff added, and the dyeing operation started. More level dyeings, possessing purer and brighter shades, are obtained. The hot pieces when up to shade are often run into a tank of cold water placed in front of the kettle. When the pieces, removed one by one, are cold, they are run from the tank into trucks, thrown into another kettle and rinsed until perfectly cold and clean.

* * * * * * *

The dyeing of wool is a science calling for judgment, skill and technical knowledge on the part of the dyer. If his sets come to him in a first-class condition it is plainly up to the dyer to produce satisfactory results. If he doesn't the management should determine why. But if stock or pieces are sent to him in a condition wherein it is impossible to obtain satisfactory results, no dyer may be held responsible for poor work. For dyeing to be a success the operations preliminary to dyeing must be complete in every detail. One mistake may be the means of spoiling a set and causing it to be redyed black. Oftentimes finishing operations after dyeing may spoil pieces dyed to perfection.

In conclusion, it may be said that successful results in dyeing are attained only when every department in the mill co-operates with the dyer.

DR. C. L. REESE CHOSEN TO HEAD NINTH CHEMICAL SHOW ADVISORY COMMITTEE

On Tuesday evening, March 13, the advisory committee of the Ninth National Exposition of Chemical Industries met at the Chemists' Club, New York, to discuss plans for the coming exposition. A good representative attendance of the committee was present and many important matters were considered. Perhaps the most interesting feature of the meeting to the industry was with reference to the election of new members to the committee upon recommendation of the Salesmen's Association of the American Chemical Industry, a committee which had been considering the coming Chemical Exposition plans for some time. The members elected to the committee included:

The president of the Manufacturing Association, Dr. Charles L. Reese, E. I. du Pont de Nemours & Co., Inc.; the president of the Salesmen's Association of the Chemical Industry, John W. Boyer, the Mathieson

Alkali Works, Inc.; the president of Equipment Manufacturers Association, Percy D. Schenck, the Duriron Company; W. Moore, New Jersey Zinc Company; Williams Haynes, Drug and Chemical Markets; H. J. Schnell, Oil Paint and Drug Reporter; Milton Kutz, Roessler & Hasslacher Chemical Company; A. G. Rosengarten. Powers-Weightman-Rosengarten Company; T. C. Oliver, Chemical Construction Company; R. Gordon Walker, Oliver Continuous Filter Company.

The committee considering the educational exhibits in the coming exposition and in view of the fund which has been set aside for that use by the International Exposition Company decided that the services of Major H. S. Kimberly be engaged to work upon certain educational exhibits for the coming exposition. Major Kimberly was previously connected with the Chemical Warfare Service and is now working along similar lines, popularizing chemistry in this country.

Dyeing Knitting Yarns

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YARNS intended for either hand or machine knitting should be handled with the greatest care in order to preserve the luster, and to prevent, as far as possible, the slightest tendency to felting. Except in the actual dyeing, any overheating in the wet process is liable to cause felting and, when this occurs, light fluffy garments are not possible.

The wools generally employed in knitting-yarn manufacture are of the finer grades, and in the raw condition contain a considerable amount of s suint that must be removed by scouring. It is during this operation that the "life" of the stock is destroyed or maintained. For this purpose, mild soaps only should be employed, and if it is necessary to fortify the scours with alkali, carbonate of potash—pearl ash—is to be recommended in preference to anything else, although various types of sodas are used on account of lower cost. At this time it is desirable to mention the use of potash or soft soaps for the scouring of fine wools. Such soaps always contain glycerine as an essential constituent, and which is not present in hard or soda soaps. The presence of glycerine seems to have a softening action on the wool that is beneficial. Adding glycerine, however, to a hard soap scour does not appear to have the same effect. Since hard soaps are cheaper than soft soaps they are almost exclusively used.

After the wool has been scoured and prepared for the mechanical operations of yarn manufacturing, it is subjected to an oiling for the purpose of lubrication. The oils used for this purpose are many. Some mills use straight oil while others make emulsions of oil and water. Emulsions are excellent, theoretically, but as usually compounded in mills, they are not true emulsions, but rather uncertain mixes of a fluid oil, water, and alkali and are seldom uniform. The main point in oiling wool is to get it on evenly, but where the oil mixture is indefinite the oil distribution on the wool will be equally indefinite. This condition invariably produces uneven yarn, and is frequently the direct cause of unevenly dyed shades.

The best oil for good wools is olive oil, being readily emulsified in the scours, and consequently easily removed. Owing to the higher prices of olive oils suitable for wool oiling, other oils have been made use of, especially oleines, many of which have a mineral oil base. Mineral oils are objectionable, inasmuch as they appear to be readily absorbed by the wool fiber substance and not easily emulsified and scoured out; mineral oil mixtures, however, have gained great importance for oiling wool, and scouring processes must be adjusted so as to remove as much of them as possible.

Finished knitting yarns must be well scoured before dyeing, otherwise uneven shades will result. The scours should be so fluid as to run off the yarn freely, while the temperature should be kept as low as possible, never exceeding 115 deg. Fahr. Excessive working should be avoided in the warm soap to prevent felting. When the yarn is believed to be sufficiently scoured, the dirty soap-liquor is run off, and the yarn rinsed clean.

For dyeing, either open kettles where the hanks are turned on sticks by hand, or machines, are used. The latter always leave the yarn in the best of condition and are to be preferred.

Most shades on knitting yarns have, for years, been dyed with acid dyes, since they are more easily applied, and when properly selected yield colors that meet every requirements for light and washing fastness. Certain heavy shades for sport knitted wear, such as golf and other stockings, as well as sweater coats, in heather effects are dyed in the raw stock, then mixed in proper proportions, and made into yarns. These shades are frequently dyed with chrome-mordant dyes, and yield shades of extreme fastness that are well adapted to the hard usage they will be subjected to. There is a wide difference between the two classes of dye. The chrome-mordant dyes do not give bright colorings, hence they do not find favor for the general run of knitted goods, or for ball yarn for individual knitting.

The choice of dyes best suited for straight acid dyeing is as follows:

Alizarine Sapphire FS.
Wool Yellow Extra Conc.
Wool Orange 2G Crystals.
Fast Crimson 6BL.
Buffalo Black SB.

With the above the dyer can produce an extremely

(*Continued on page* 263.)

Lime and Cotton

Effects and Uses of Lime Boiling—Surface Activity—Saponification—Saponification by Means of Lime in the Open Kier—Lime Salts Used in Cotton Bleaching, Dyeing and Finishing—Mordants Used for Dyeing Light Shades—Lime in Printing Alizarine Red—Recovery of Soap Waste—Calcium Sulphate, Mineral Satin White, $CaSO_4$

By WILLIAM B. NANSON

IT is well known to those engaged in bleaching that if any classes of cotton goods come up too soft in the finishing, a resort to the lime-soda ash in place of caustic soda boiling soon puts them right. Lime boiling is not a mere survival of the days of empiricism; it is the best treatment for some classes of goods, for all tests have shown it to be the best means of eliminating the waxy matters from the cloth. The waxy matters of unbleached cotton goods contain both an unsaponifiable and a saponifiable portion; during the lime boil a lime soap is formed with the latter, and the subsequent sour frees the fatty acid from this soap so that when the goods go to the ash boil the wax consists of an unsaponifiable fat existing along with a fatty acid. The alkali of the boiling liquor evidently unites immediately with the fatty acid, producing a soap, and at the same time removes some of the unsaponifiable matter by disturbing it and producing an emulsion. The soap is produced quickly as the fatty acid is free, and a concentration of the soap in the neighborhood of the unsaponifiable wax is produced.

It has been found that on adding a solution of an alkali to a mineral oil and a fatty acid the emulsification was practically spontaneous, and it was proved that this was due to the rapidity of the formation of the soap layer and the plasticity of the layer. Now we have these conditions reproduced in the case of the lime and soured goods being led into the soda-ash kier, for the wax of the cloth here consists of a fatty acid and an unsaponifiable substance resembling mineral oil in its characteristics.

Emulsification is due to a modification of the properties of the surface layers separating the oil from the solution. This modification may be shown by the following experiments: If a little olive oil be poured gently on the surface of water so as to form a layer about half an inch thick, and if the interface be disturbed slightly by means of a glass rod, it will be found difficult to detach a small drop of oil from the main body of the oil. If now a dilute solution of soda be used in place of the water it will be found that the slightest disturbance of the interface causes a cylinder of oil to be projected into the solution. This cylinder lengthens till it becomes thin, and finally breaks into small drops. In the case of the first experiment of the oil and the water, the surface resists extension, while in the case of the second experiment there is no resistance to extension. Emulsification is due to the lessening of this tendency toward contraction, which all surfaces possess by virtue of their surface tension. Emulsifying agents act, therefore, in virtue of the effect they produce in diminishing the tension of the surface separating water from greasy matter. This effect, which is due to the accumulation of the dissolved substance in the surface layers, is generally termed "surface activity."

Surface Activity

According to Shorter, the "surface activity" of a dissolved substance may readily be measured by means of an instrument known as the stalagmometer. This consists of a pipette, the lower end of which is bent through 180 deg., to the upper end of which is attached, by means of a rubber tube, a fine capillary. The instrument is filled with oil, the lower end is placed in the solution to be tested, and the oil allowed to flow. Owing to the surface tension the oil does not flow in a continuous stream, but in a series of separate drops, which are the larger the greater the surface tension, and the smaller, therefore, the greater the "surface activity" of the substances in the solution. The object of the capillary tube is to render sufficiently slow (by means of air friction) the rate of flow of the oil. By means of this instrument it can be shown (a) that a solution of alkali has a great "surface activity" against ordinary olive oil; (b) that it has no such activity against a perfectly neutral olive oil or a hydrocarbon oil; (c) that it has a marked "surface activity" against a hydrocarbon oil to which a little fatty acid has been added; (d) that a soap solution has a marked "surface activity" against any kind of oil.

The above experiments prove conclusively the following fundamental principles relating to emulsification: (1) The emulsifying power of an alkali depends upon the presence of free fatty acid in the oil to be emulsified; (2) saponification of glycerides plays no part in emulsification; (3) emulsification is due to the formation of a surface layer of soap; (4) the surface layer may be formed either by the interaction of alkali and the free fatty acid in an oil, or by actual absorption (i. e., accumulation in the surface layers) from a solution of soap.

From the above, the advantages of the lime boil in

cotton bleaching are very obvious; it shows conclusively that by the lime boil alone is it possible to completely remove the unsaponifiable matters in the cloth. It does this by (1) forming an insoluble lime soap, which in turn is converted into a fatty acid by the souring and washing; in the subsequent soda boil this fatty acid, in conjunction with the alkali which is in excess, emulsifies the unsaponifiable matters and renders them in such condition that they may be washed out, while at the same time the *excess* alkali saponifies into a soluble soap, easily removed, the fatty acids of the lime soap, and in doing so carries out the theory which we have propounded above: that the emulsifying power of an alkali depends upon the presence of free fatty acids in the unsaponifiable oils or waxes to be emulsified.

Caustic soda will not do this in practice to any appreciable extent; because, while it saponifies the saponifiable waxes and fats into soaps as does the lime, though to a somewhat less reliable degree, the resulting soaps are soluble and wash out in the subsequent washings in water and are thus entirely eliminated; but the lime soaps are insoluble and remain in the goods, even after souring, as fatty acids, where they play their part as assistants to the soda ash in the emulsification of the unsaponifiable matters, so that all, both unsaponifiable and saponified, may be removed by the processes which follow.

The power which lime has of saponifying fat is rather remarkable, especially under pressure. It would look, at first sight, that since the lime soaps are insoluble, saponification would proceed very slowly; but as a matter of fact it is not so. This, we believe, is largely due, especially in the case of heavy goods, to the fact that the preliminary liming or mechanical impregnation of the lime into the cloth sets up a number of local centers of chemical activity.

After the lime boil the goods should be well washed and soured in a dilute solution of hydrochloric acid at 2 deg. Tw. After this sour we have only fatty and pectic acids and unsaponifiable fats with soluble chloride of calcium to consider. The wash from the sour into the soda kier removes the latter, and the boil in soda dissolves the fatty and pectic acids and removes the other impurities by emulsification, although it has little power of directly saponifying neutral fats.

When sulphuric acid is used the lime left in the fabric is very considerable, amounting in many cases to as much as 0.52 per cent. This is partly present as lime soap, partly as carbonate and unremoved sulphate of lime. Some bleachers seek to get over this by using a half-and-half mixture of sulphuric and hydrochloric acids; but this serves no very definite purpose, because if there is the slightest excess of sulphuric acid the lime will be in the goods just the same, as the sulphuric acid affinity for the lime is greater than that of the hydrochloric acid.

Saponification

This is the operation by which oils and fats are combined with the alkali earths and metals to form soaps. Technically, this term has a wider meaning, and applies to any operation that brings about a separation of an organic acid from an organic base. When an animal or vegetable fat is boiled with a caustic alkali, a double decomposition takes place. The products are the alkali salts of the organic acids of the fats and the glycerine.

At a pressure of three atmospheres it requires from 12 to 14 pounds of caustic soda to saponify 100 pounds of fat, whereas the quantity of lime required to accomplish the same result is from 2 to 4 per cent; 8.7 per cent of lime is theoretically required, but under conditions maintained in the kier from 2 to 4 per cent has been found in practice to be sufficient. Entirely aside from any economy in favor of the lime as a saponifier, it is evident from the above that lime under pressure is more energetic and thorough than is caustic soda.

The saponification of a fat is a progressive and step-like reaction, based on its chemical constitution as a triglyceride. In a mixture of fats, the individual fats tend to impart their properties to one another. Certain oils, notably cocoanut and palm kernel, require caustic lye of high density to effect combination. With others, as tallow and palm oil, saponification ensues readily with caustic soda lye of a lower density.

The natural oil in cotton saponifies with difficulty and only after continued boiling in caustic soda, especially when saponified alone. The absence of free fatty acids tends to retard its saponification. Combination with the alkali is hastened when tallow is present, or on the addition of soap scraps. With lime there is no difference in action (i. e., in actual bleaching practice); it saponifies all these different fats in about the same degree and much more rapidly and thoroughly than caustic soda. The chemical changes which take place on boiling fats with strong bases, which act as catalysts, and which results in the formation of glycerol and salts of the higher acids, has been termed saponification; but in a wider sense every chemical process by which oils and fats are resolved into their proximate constituents, glycerol and fatty acids, is also called saponification, even if no bases be used to effect the reaction. We may say here that the term "saponification" is almost exclusively used in common practice, but in papers of a more "high-brow" and scientific character its synonym, "hydrolysis," is the one usually used.

The chemical change which oils and fats undergo on being hydrolized or saponified is expressed by the following equation:

$$\begin{matrix} & OR & & & OM \\ 2C_3H_5 - & OR & + 3M.OH = C_3H_5 - & OM & + 3R.OH \\ & OR & & & OM \end{matrix}$$

stands for hydrogen or a monovalent metal, such as sodium (caustic soda, etc.). In the case of a bivalent metal, such as calcium (lime), the equation would be expressed thus:

$$2C_3H_5\begin{matrix}OR\\OR\\OR\end{matrix} + 3Ca(OH)_2 = 2C_3H_5\begin{matrix}OH\\OH\\OH\end{matrix} + 3Ca(OR)_2$$

It is possible to saponify fats by using water alone, as the hydrolyzer at a steam pressure of 15 atmospheres (225 pounds); but if a very small portion of lime be added, say 1 per cent, the process can be accomplished in half the time and with half the steam pressure. Now, as 1 per cent of lime is quite insufficient to saponify the fats by itself, it is evident that the lime acts as a catalyzing agent to assist the water to hydrolize the fat and afterward as a saponifier, as far as it will go, to form a lime soap with the free fatty acids liberated by the hydrolizing process.

Now, it will be seen from this that while boiling water under pressure will hydrolize fats, and the addition of 1 per cent of lime, acting as a catalyst, will accelerate the process to one-half the time and pressure, there would be little lime soap formed, because there is not enough excess lime present to combine with and neutralize *all* the fatty acids released by the hydrolization of the fat.

It has been indicated above that catalytic agents are capable of accelerating the process of hydrolysis, and that a very small amount of such an agent is capable of producing hydrolysis at a more rapid rate and at a lower temperature in the case of aqueous saponification under pressure. If bases are used as accelerating agents (and only the bases of bivalent metals will fully answer—lime, baryta, strontia), it would therefore follow that it should not be imperative that the bases should be present merely in their molecular proportion to the quantity of the fatty acids that will result in complete hydrolysis. The greater the amount of the bases present the more rapidly should the resolution of the glycerides into their proximate components take place and the greater should be the amount of the salts of the fatty acids formed. But a deficiency of the bases necessary to neutralize all the fatty acids obtained by complete hydrolysis should not preclude the completion of the hydrolysis itself, even if it precluded the complete neutralization of all fatty acids and their conversion into a soap; for if bases be chosen as catalysts a further chemical action takes place (i. e., the combination of the base with the liberated fatty acid and the formation of a soap).

Since the velocity of saponification stands in direct ratio to the quantity of the bases, then in the presence of an excess of bases it should be possible to lower the temperature and shorten the time required for effecting practically complete hydrolysis. These views are confirmed by practice in the several modifications of the technical process of saponifying fats by means of lime.

Saponification by Means of Lime in the Open Kier

The amount of caustic lime—CaO—required for a triglyceride having the mean molecular weight 860 is, according to the equation containing lime given above, 9.7 per cent, but even prolonged boiling with steam in an *open vessel* with that proportion of lime will not lead to complete saponification. Unless the proportion of lime be raised to 12 to 14 per cent, the hydrolysis of the triglyceride cannot be brought to an end in an open vessel (i. e., at a temperature of 212 deg. Fahr.).

If the lime be considered as a catalytic agent, then it should be possible, in correspondence with the views expressed above, to reduce the proportion of the lime. This is actually done in general practice by carrying out the hydrolysis of the fats and waxes of the cotton by means of lime in a high-pressure kier. Under these conditions the proportion of caustic lime can be gradually reduced as the temperature is increased, until at pressure of 12 atmospheres (corresponding to a temperature of 190 deg. Cent.) even 1 per cent of lime suffices for complete hydrolysis. This pressure and temperature is, of course, impracticable, because cotton turns brown owing to oxidation (incipient decomposition) at a temperature of above 131 deg. Cent. (i. e., 266 deg. Fahr.). This is the extreme point of safety for cotton; but at this temperature, which represents a pressure of about 2.75 atmospheres, it should take only from 2 to 4 per cent of lime to hydrolize all the fats. Although the glyceride is, practically speaking, completely hydrolized, only so much of the fatty acids liberated by the hydrolysis is neutralized by the lime (i. e., converted into the lime soap) as is chemically equivalent to the quantity of lime employed.

We would impress it upon the reader that a catalyst acts merely as a go-between; it does its work without undergoing any chemical change itself, and that in the case of the lime and fats it acts in a dual capacity—first, as a catalyst it assists the water in a pressure kier to hydrolize the fats into their component parts, then as a saponifier it combines with and neutralizes the fatty acids freed by the hydrolysis, forming an insoluble soap. There is no line of demarkation between these two processes; they are continuously going on simultaneously until all the fatty matters in the cotton are hydrolized and converted into soap, and this *complete* conversion is what constitutes a perfect boil and, incidentally, a perfect bleach.

It may be said that the lime combines with the fatty acids to form an insoluble soap, in definite proportions.

When using lime for the saponifier, the goods may

be wet out and steeped overnight, which is the safest where R denotes the radicle of any fatty acid and M plan, and then run through milk of lime in a liming machine into the kier; or they may be run through the lime while in a dry condition direct from the gray room. Dissolve about 110 pounds of lime into a paste for a 3-ton kier. This lime should be slaked and made into a paste a few days before using, with great care so that all is slaked and the paste worked smooth and homogeneous. It should then be mixed with water and well agitated in a separate vessel, and run continuously through a fine sieve into the liming machine in such a manner that the goods become thoroughly impregnated with the lime as they are run into the kier. The sieve is to prevent any lumps of unslaked or undissolved lime from passing into the goods, which would result in "shotholes" being burnt through the goods wherever they might come in contact with them. Lime water should never be run into the kier; but if for any good reason it is found necessary to do this, it should be run in from the bottom, never from the top. The cloth at the top of the kier, after filling, should be well covered with burlap and held down with iron crosspieces.

We believe in plenty of water in the kier; it should come up about 6 inches above the top of the cloth. If the goods ever get dry on the top there will be a number of pieces badly stained and probably tender. After filling the kier with the lime-impregnated goods they should be boiled in water (not lime water) for ten hours under pressure, say, of 15 to 25 pounds.

Probably the best type of kier for all practical purposes is the one fitted with a circulating pump and heater. In this type the circulation is constant and positive and no live steam is blown into the kier.

After boiling ten hours the kier is blown off at the bottom and *as soon* as the pressure permits, cold water is run in at the top until the kier is full of water to cover the cloth. Circulate this for a little while cold and run off.

The goods are then washed in the washing machine and soured with hydrochloric acid at 2 deg. Tw. Sulphuric acid should never be used with a lime boil as it forms an insoluble sulphate of lime with the lime which largely remains in the goods and can hardly be removed; moreover, it has a tendency at times to tender the goods. we would say here that hydrochloric acid will not answer for the white or final sour, as it leaves a slight yellow tinge behind. Moreover, it has such a strong affinity for the cotton fiber that it is difficult, if not quite impossible, to wash out of the goods. The goods should stand in the gray sour a few hours, or overnight, if necessary, but no longer, unless they are sprayed down with water to prevent drying on the exposed parts which would result in tender places and air stains.

It is essential that the goods be *thoroughly* washed from the gray sour and so on into the soda ash kier, where they must be plaited perfectly level in the kier. This is important—if there are bunches in the kier they will boil out unevenly.

Dissolve 130 pounds soda ash, 50 pounds caustic soda, 20 pounds soap (any soft soap will answer, but not Turkey red oil) and enough water to cover the goods. After the kier is filled, run the soda ash liquor (previously boiled) into the kier from below (always below). Boil as before for eight to ten hours, according as the goods may be light or heavy, then blow off and cool off as before. It is always advisable to run in hot water into the kier after blowing off and circulate for one or two hours; then run this off cool, and wash off in the with with cold water; then through the washing machine into the chemic. Chemic for three to five hours at ½ to ¾ deg. Tw., according to the quality of the goods. We are sure that any quality of piece goods will bleach well with ¾ deg. Tw. as the maximum strength but seldom, if ever, is this strength required. If this does not do it, then the bleacher may be sure that the goods are not properly boiled.

Wash out the chemic and sour in sulphuric acid at 1 deg. Tw. After standing about two or three hours, then wash goods twice, three times if necessary, to fully eliminate the acid. This can be ascertained by testing with litmus paper. This will finish the bleaching operations for most goods, but it is generally admitted that sulphuric acid is never fully *washed* out; therefore, many classes of goods should be neutralized. Perhaps the best thing to use is ammonia, as this material when dried with the goods is driven off and volatilized and leaves nothing behind. Sometimes soda or borax is used, but these will yellow the goods in time and are therefore objectionable if the goods are to be finished white; probably acetate of sodium would be better and safer than either of these. It may be said, however, that if the goods are to be made up into canvas shoes, experience has shown us that, unless the finished shoes are to be vulcanized, borax is the best to use for neutralizing, as it acts as a preventive to the "pinking" of the goods without "yellowing" to any appreciable extent, but, if the finished shoes are to be "vulcanized" ammonia must be used or the goods will turn yellow in the vulcanizing process. Goods for dyeing light shades may be neutralized with soda ash or acetate of soda.

The process of neutralizing is carried out sometimes in the water mangle, but the quicker and cheaper way is to do it in the bleach house. A good plan is to run the goods through a squeezer with a hot-water box attached. The goods can be chased through the neutralizing liquor in the water box from the final washer and squeezed dry into the finished white bins. Many lines of goods could be dried direct over the cans without going through the water mangle, if this process is adopted.

We would say here, most emphatically, that all goods that are to be subsequently vulcanized must be neutralized after souring and washing or their strength will be impaired to a greater or less degree by the vulcanizing process.

We would say here, most emphatically, that all goods that are to be subsequently vulcanized must be neutralized after souring and washing or their strength will be impaired to a greater or less degree by the vulcanizing process.

Lime Salts Used in Cotton Bleaching, Dyeing and Finishing

Of the lime salts used directly in the bleaching, dyeing and finishing of cotton goods, those which are mostly used are acetate of lime, calcium carbonate, calcium hypochlorite, calcium chloride, calcium sulphate, calcium ligno-sulphinate, calcium sulphocyanide or thiocyanate.

Calcium Acetate—Acetate of Lime $Ca(C_2H_3O_2)_2$.—Brown or gray acetate of lime is prepared from pyroligneous acid by its neutralization with lime. If the calcium acetate is prepared from the crude pyroligneous acid it is known as *brown acetate*, but if the distilled liquor has been used it is known as the *gray acetate*. After standing, the liquid is syphoned off and evaporated, the tarry impurities which rise to the surface being skimmed off. After removal from the evaporating vessel the crude acetate is carefully dried. It decomposes if too strongly heated. This product, when prepared from the *brown* (crude) liquor, is dark colored and contains charcoal and decomposed tarry matters. This acetate may be purified by dissolving in three parts of hot water, filtering through mineral charcoal and again crystalizing, thus yielding a nearly colorless product of the composition: $Ca(2H_3O_2)_2 + 2H_2O$; this is easily soluble in water, the solution being acid to litmus. However, for all practical dyehouse purposes we advise the use of the *gray acetate* and all the formulae in this article, where acetate of lime is used, are based upon its use.

White acetate of lime is prepared by neutralizing about seven parts of 30 per cent acetic acid with one part of calcium oxide (quicklime).

Commercial acetate of lime generally contains about 65 per cent of the pure acetate of lime and from 1 to 8 per cent of matter insoluble in water. Calcium sulphate, hydrate, and carbonate, together with more or less tarry matter, are the usual impurities found. Calcium acetate is used as a mordant in the dyehouse, calcium forming an essential part of some of the alizarine colors (lakes). Acetic acid and many other acetates are also prepared from this salt by metathesis or double decomposition.

In the dye works or print works the only direct calcium salt usually used as an assistant mordant is the acetate. Gray acetate of lime may be used if filtered absolutely free of impurities and also equally free of all traces of iron, but it is the usual custom to prepare this at the works by dissolving quicklime in acetic acid. Thus: 5 kilos quicklime are mixed with 25 kilos of hot water. This mixture is then added gradually to about 25 kilos of acetic acid at 9 deg. Tw. Add the lime until the mixture is slightly alkaline; allow it to settle, and if the filtered liquor is free from iron, decant it; if not, add more lime and settle again after stirring it up well. When free of iron decant the supernatant liquor, wash the precipitate and add the clear washings to the strong solution. Then acidify with acetic acid, allowing about 2 per cent excess, and set at 23 deg. Tw. Bright red shades dyed or printed with alizarine can only be obtained by a combination of tin, aluminum, *lime* and oil, and, as a matter of fact, *lime*, is apparently necessary to the full development of *all* alizarine colors (except the blues and greens) and consequently it enters into all that are employed as self-colors. Chalk is sometimes used in place of acetate of lime in the dye baths, but its use is risky and its action uncontrollable. Owing to the changeable character of the alizarine, it is impossible to decide the exact quantity of chalk necessary to the development of the color of any particular lot of goods; if too much is used the color comes up cloudy and dull, and if too little, the color is bare and undeveloped. With acetate of lime there is no danger of this, as the alizarine takes up only just as much lime as it requires for its development, leaving the freed acetic acid and the excess acetate in the bath where they will do no harm.

The mordant dyestuffs, the chief representative of which are the alizarines, are fixed on the fiber with the aid of metallic mordants. The color lakes, when formed on the fiber of most of these dyestuffs, are very fast to light, washing, soap, acids and alkalis. These dyestuffs are very extensively used in yarn and piece dyeing.

On cotton the alizarine dyestuffs are chiefly dyed on an aluminum mordant. Chromium and iron mordants are less extensively used in dyeing, but are largely used in calico printing. The principal use of the alizarines in dyeing is in the production of Turkey reds, for which purpose in former times *madder* was extensively employed.

The fastest shades of Turkey red are produced by the old process of dyeing, although this entails a larger number of operations than the new process.

In the latter process Turkey red oil is used, while in the former the material is oiled with an emulsion of rancid olive oil in water, with the addition of a small quantity of potash, but in either case the mordant used is acetate of alumina made from acetate of *lime* and the assistant mordant is *acetate of lime* straight.

The new Turkey red process goes something like this:

1. Boil the goods with 3 per cent soda ash for four hours at thirty pounds pressure, rinse thoroughly and squeeze dry.

2. Pass the moist goods through a bath containing twelve to fifteen gallons of Turkey red oil (50 per cent) per 100 gallons of liquor. Dry during twelve hours at 149 deg. Fahr. This operation is repeated.

3. Ten thousand parts water, 25 parts acetic acid, 12 deg. Tw.; 54 parts aluminum acetate, 19 deg. Tw.; 10 parts acetate of lime, 28 deg. Tw. The aluminum acetate solution is prepared in the following manner: Dissolve separately 1,908 parts of alum (sulphate of alumina is best) in 2,000 parts hot water, and 1,590 parts of

acetate of lime in 1,600 parts of hot water. Mix, allow to cool, and add 150 parts of soda crystals. Allow to settle for twenty-four hours, draw off the clear solution and dilute to 19 deg. Tw.

The above mordant (3) is for pinks or light shades; for reds the proportions of acetic acid, acetate of alumina and acetate of lime must be increased so that the mordanting liquor stands at 12 to 15 deg. Tw. Heat the mordant to 86 deg. Fahr., pass the goods through it; let them lie for three hours and dry below 104 deg. Fahr.

4. Work the goods for one-half hour at 122 deg. Fahr. in a bath containing per 1,000 parts of liquor, 5 parts of chalk and 5 parts of sodium phosphate, and then thoroughly rinse.

5. For the dyeing bath 8 per cent, alizarine 20 per cent, is generally used. The different shades of Turkey red can be produced by combining the red and blue shades of alizarine in various proportions; 10 per cent acetate of lime of 28.5 deg. Tw., and 1 per cent of tannic acid (both calculated on the amount of dyestuff used) should be added to water which shows a hardness of 7½ per cent. The yarn is worked in the cold dye bath for one-fourth hour. The temperature of the bath is then raised during one hour to 194 deg. Fahr., and the yarn is worked at this temperature for one-half hour. After dyeing, rinse immediately, hydro extract and dry.

6. Steam two hours at a pressure of 22 pounds.

7. In order to obtain a pure red, the yarn is boiled for two hours in a closed vessel under a pressure of 30 pounds with 2 parts of soap, 0.3 part soda ash and 0.1 part of tin salt per 1,000 parts of water.

The method of dyeing "new pink" is similar to the "new red," except that much weaker baths are used and an acetate of alumina mordant standing at 7.2 deg. Tw., is used, which is prepared in the following manner: 90 parts aluminum sulphate (free from iron) are dissolved in 643.5 parts water (free from iron); 28.5 parts sulphuric acid, 168.5 deg. Tw., and 174 parts acetic acid, 40 per cent, are added; the mixture is well stirred and 89 parts of basic aluminum carbonate are slowly added (temperature 95 to 104 deg. Fahr). The solution is allowed to stand for a short time decanted, and made up with water to 1,000 parts. A very stable solution of aluminum acetate of 23.2 deg. Tw., is thus obtained.

The following method is recommended for dyeing alizarine dyestuffs by the Bayer Company, on cotton piece goods: Slop pad twice in Turkey red oil (neutralized with ammonia) and 4 parts of water (free from lime), dry, steam one-fourth hour at 4 to 14 pounds pressure or age for one to two days in a warm damp room at 100 to 120 deg. Fahr. Slop pad either once or twice with sulphoacetate of alumina 8 to 9 deg. Tw., allow to remain (steep) two hours, dry or age as above. Work for one-half hour, at open width, in a bath with 6 pounds of chalk and 2 pounds of sodium phosphate per 100 gallons of liquor, at 105 deg. Fahr. Wash carefully, dye with the necessary amount of dyestuff with the addition of 9.5 per cent of acetate of lime, 29 deg. Tw., and 0.1 to 0.2 per cent tannic acid, calculated on the weight of dyestuff used. Work in the cold bath for one-fourth hour, heat to 160 deg. Fahr. within the hour and dye at this temperature for one-half to three-fourths hour. Wash in water, which must be free of "free" lime; oil with a solution of one part Turkey red oil, 50 per cent, and 9 parts water (free from lime); run once or twice in this and steam one and one-half to two hours at 14 to 22 pounds pressure. After this steaming treat with a solution containing per 100 gallons of water, 2 to 5 pounds of olive oil soap, 0.4 pound of soda, 0.15 pound tin crystals for one-half to one hour at 185 deg. Fahr., or boil for one hour under a pressure of 7 to 14 pounds. Finally wash and dry in the air.

It will be noted here that in all the operations of alizarine dyeing the water used must be free of lime. In the actual dyeing operation the addition of acetic acid and acetate of lime assures us of this, even if lime be present in the water, but in the mordanting and oiling operations we have no other safeguard than the freedom of the water itself from hardness (lime). Iron must also be eliminated from all materials and waters used in dyeing *reds* or the color will be dull and purplish—iron, even in minute quantities, being a powerful mordant for alizarine black.

Meister, Lucius and Bruning's method of mordanting for Turkey red is like this: 3.1 kilos at 28 deg. Tw., 1.8 liters acetic acid (50 per cent) per 1,000 liters of water.

Alizarine Yellows, Alizarine Orange, Alizarine, Reds, Alizarine Clarets, Alizarine Browns, Alizarine Greens, may be dyed by impregnating the goods with the dyestuff first and applying the mordant afterwards. This method is especially suitable for dyeing light pinks and mode shades, while it is less suitable for reds and heavy shades. The alizarine dyestuffs are dissolved in water, free from lime, with the addition of ammonia or dissolving ether, and neutral Turkey red oil is added to the dye bath. The cotton is impregnated, evenly squeezed or wrung and dried at 122 to 140 deg. Fahr. The material is then passed through the mordanting bath, wrung or squeezed and steamed, or it may be steamed after it has been dried. One or two hours steaming without pressure is sufficient. The cotton is finally soaped or cleared.

The dyestuff solution for the above is made with one part alizarine paste (20 per cent), 13 parts water free from lime, 2 parts ammonia (25 per cent).

First Bath—Eighty-three parts water, free from lime; 12 parts neutral Turkey red oil (80 per cent), diluted 1:4; 5 parts of above dyestuff solution.

Second Bath—Ten thousand parts water, 25 parts acetic acid (12 deg. Tw.), 54 parts aluminum acetate (19 deg. Tw.), 9.5 parts acetate of lime (28 deg. Tw.).

Third Bath—Ten thousand parts water, 5 parts soda, 1 part tin salt, 5 parts soap.

The above is more especially applicable for dark and

(*Continued on page* 251.)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
LOUIS A. OLNEY
Lowell Textile School, Lowell, Mass.

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A. K. Johnson, Secretary, Lowell Textile School, Lowell, Mass.

Rhode Island Section—
Ralph F. Culver, Chairman, Box 269, Providence, R. I.
Leslie L. Bamberger, Secretary, U. S. Finishing Company, Providence, R. I.

New York Section—
P. I. Wood, Chairman, Oriental Silk Printing Company, Haledon, N. J.
L. C. Lewis, Secretary, 95 Madison Avenue, New York City.

Philadelphia Section—
Robert E. Rose, Chairman, E. I. du Pont de Nemours & Co., Wilmington, Del
Elmert C. Bertolet, Secretary, Philadelphia Textile School, Philadelphia, Pa

TWELFTH COUNCIL MEETING

The Twelfth Council Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., on Friday, January 12, 1923. The following members were in attendance; Prof. L. A. Olney, William H. Cady, William D. Livermore, Winthrop C. Durfee, A. E. Hirst, Dr. W. M. Scott, P. J. Wood, William K. Robbins, William R. Moorhouse, H. Christison and W. E. Hadley.

A telegram was received from R. F. Culver expressing regret at being unable to attend.

The following applicants were admitted to membership:

Active Membership

Atkinson, R. C., 59 South Whipple Street, Lowell, Mass.
Colorist, Aniline Works, South Middleton, Mass.

Bonnet, F. M., York and Colgate Streets, Jersey City, N.J.
President and Chemist, United Chemical Products Corporation.

Cassidy, T. A., 85 Fort Greene Place, Brooklyn, N. Y.
Chemist, Tinc Tura Laboratory.

Fiebiger, Peter, R. F. D. No. 3, Plainfield, N. J.
Colorist, U. S. Appraisers' Stores, New York City.

Fish, Harry G., 76 Church Boulevard. Carney's Point, N. J.
Colorist, Du Pont Company.

Newton, Oscar A., 31 Fallon Avenue, Providence, R. I.
Cotton Dyer, Franklin Process Company.

Russell, J. W., Lawrence, Mass.
Chemist, U. S. Worsted Company.

Stulz, J. H., York and Colgate Streets, Jersey City, N. J.
Secretary-Treasurer, United Chemical Products Corporation.

Well, R. W., C and Westmoreland Streets, Philadelphia, Pa.
Vice-President and Foreman Dyer, Nicetown Dye Works.

Widmann, E. A., 122 Hudson Street, New York City.
Laboratory Supervisor, H. A. Metz &Co.

Junior Membership

Dana, Albo N., Providence, R. I.
Chemist, Franklin Process Company.

Horne, Hugh J., Box No. 1, Spindale, N. C.
Chemist, Spinners Processing Company.

Martin, J. J., 85 Fort Greene Place, Brookklyn, N. Y.
Vice-President and Director of Dyeing, Tinc Tura Laboratories.

Massarene, J. S., 85 Fort Greene Place, Brooklyn, N. Y.
Apprentice Color Chemist, Tinc Tura Laboratories.

The President appointed William D. Livermore chairman and Hugh Christison member of a committee to draft an amendment to the Constitution which would grant permission for the formation of Junior Local Sections. The necessity of such an amendment was evident when more than thirty members of the Lowell Textile School presented applications for junior membership, with the request that they be permitted to form such a Junior Section. It was the opinion of the Council that such formation should be permitted, and that the Junior Local Section should be composed of junior members who

would be under the guidance and supervision of the Northern New England Local Section. They will have their own meetings.

W. E. HADLEY, Secretary.

TWELFTH RESEARCH COMMITTEE MEETING

The Twelfth Meeting of the Research Committee of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Saturday, February 17, 1923.

The following members were in attendance: Prof. L. A. Olney, William H. Cady, George A. Moran, W. C. Durfee, A. E. Hirst, William K. Robbins, William D. Livermore, William R. Moorhouse, P. J. Wood, R. F. Culver, W. E. Hadley and H. Christison.

The committee on the Fastness of Dyed Materials to Light reported progress, but as yet have nothing definitely in shape for publication.

The committee considering the Fastness of Dyed Materials to Perspiration reported progress.

Respectfully submitted,

W. E. HADLEY, Secretary.

THIRTEENTH COUNCIL MEETING

The Thirteenth Council Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., on Saturday, February 17, 1923. The following members were in attendance: Prof. L. A. Olney, William H. Cady, George A. Moran, W. C. Durfee, A. E. Hirst, William K. Robbins, William D. Livermore, William R. Moorhouse, P. J. Wood, R. F. Culver, W. E. Hadley and H. Christison.

The following applicants were admitted to membership:

Active Membership

Baxter, George S., 14 Highland Place, Larchmont, N. Y.
Foreman and Dyer, Bronx Company.

Guiterman, Edward W., 113 High Street, Boston, Mass.
Demonstrator and Salesman, National Aniline & Chemical Company.

Harper, Kenneth L., 627 South Forty-ninth Street, Philadelphia, Pa.
Chemist and Head Dyer, Franklin Process Company.

Jefferies, William H., 316 Hudson Street, New York City.
Textile Chemist, U. S. Testing Co.

Kerwin, Jr., William J., 81 Walnut Street, New Bedford, Mass.
Assistant Superintendent and Chemist, Beacon Manufacturing Company.

Traver, William A., 14 Rose Court, Providence, R. I.
Assistant Manager, Franklin Process Company.

Wohlar, William A., 84 Broadway, West Brighton, Staten Island, N. Y.
Agent and Superintendent, Claysmith Company, Inc.

Junior Membership

Crompton, Fredk., 159 Central Street, Central Falls, R. I.
Textile Chemist, Glenlyon Yarn Dye Works.

Eck, Frank E., 234 Vermont Avenue, Providence, R. I.
Chemist, U. S. Finishing Company.

Goulet, Nelson T., 166 Sabin Street, Pawtucket, R. I.
Chemist, Sayles Finishing Plants.

Lamont, Arthur, 34 Brook Street, Thornton, R. I.
Assistant Dyer, U. S. Finishing Company.

The following list of applicants were admitted to Junior Membership, they at the present time being members of the Lowell Textile School:

Anderson, A., 1 Highland Avenue, Wakefield, Mass.
Babigan, Ray, 121 Bellevue Street, Lowell, Mass.
Bachelder, Charles E., 37 Grace Street, Lowell, Mass.
Bailey, Lester H., 14 Sidney Street, Lowell, Mass.
Baker, Maurice S., 48 Intervale Street, Roxbury, Mass.
Barrett, Andrew E., 94 School Street, Lowell, Mass.
Bell, Edward B., 64 Humphrey Street, Lowell, Mass.
Booth, James M., 218 Myrtle Avenue, Boonton, N. J.
Buetes, William H., 115 Mount Vernon Street, Lowell, Mass.
Chase, Robert W., 51 Sixth Avenue, Lowell, Mass.
Chen, W. P., Lowell Textile School, Lowell, Mass.
Clement, D. Scott, Lowell Textile School, Lowell, Mass.
Cohen, Raphael, 63 Ware Street, Lowell, Mass.
Crowe, Joseph B., 220 Thorndike Street, Lowell, Mass.
Donovan, Joseph R., 115 Mount Vernon Street, Lowell, Mass.
Fiendel, George P., Lowell Textile School, Lowell, Mass.
Hathorne, Berkeley L., 518 Main Street, Stoneham, Mass.
Hibbard, Fredk. W., 102 Cambridge Street, Lawrence, Mass.
Houghton, Robert, 14 Lincoln Street, Stoneham, Mass.
Huntington, Arthur P., 43 Fifth Street, Lowell, Mass.
Hurwitz, Jacob, 8 Parkman Street, Boston, Mass.
Jaeger, Jr., Robert W., 20 Oakland Street, Methuen, Mass.

Johnson, Philip S., 372 Merrimack Street, Lowell, Mass.
Pierce, G., 38 Kenilworth Street, Everett, Mass.
Ryan, Lawrence P., 81 Marion Street, Somerville, Mass.
Sargent, Robert E., 21 Kerby Street, Haverhill, Mass.
Twitchell, George W., 29 Ellis Road, Swampscott, Mass.
Villa, Louis J., 100 Riverside Street, Lowell, Mass
Wang, Chen, 91 Mount Washington Street, Lowell, Mass.
Waples, J. Edward, 142 Riverside Street, Lowell, Mass.
Whelton, George B., 121 Cross Street, Lowell, Mass.
Wilmot, William E., 298 Pawtucket Street, Lowell, Mass.

The matter which should be embodied in the coming Year Book was discussed at some length, and it is hoped that rapid progress will now be made in this connection.

It was voted to publish the Fastness Tests Upon Wool, Cotton and Silk in the Year Book as provisional methods.

The President was authorized to write a letter endorsing the work being undertaken by the National Research Council, Washington, D. C., in the publication of International Critical Tables.

A committee consisting of R. F. Culver, Chairman, P. J. Wood and W. C. Durfee was appointed to consider the choice of a suitable emblem for the Association.

Very respectfully submitted,
W. E. HADLEY, Secretary.

THIRTEENTH RESEARCH COMMITTEE MEETING

The Thirteenth Research Committee Meeting of the American Association of Textile Chemists and Colorists was held Friday afternoon, March 9, at the Engineers' Club, Boston, Mass.

The following members were in attendance: Prof. L. A. Olney, William H. Cady, George A. Moran, William D. Livermore, W. C. Durfee, A. E. Hirst, William K. Robbins, William R. Moorhouse, P. J. Wood, R. F. Culver, Dr. W. M. Scott and Dr. W. J. Murray.

The committees considering the Fastness to Light and the Fastness to Perspiration reported progress.

Respectfully submitted,
W. E. HADLEY, Secretary.

FOURTEENTH COUNCIL MEETING

The Fourteenth Council Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., on Friday, March 9.

The following members were in attendance: Prof. L. A. Olney, William H. Cady, George A. Moran, William D. Livermore, W. C. Durfee, A. E. Hirst, William K. Robbins, William R. Moorhouse, P. J. Wood, R. F. Culver and Dr. W. M. Scott.

The following applicants were admitted to membership:

Active Membership

Bume, Felix L., 8 Thomas Street, New York, N. Y.
Assistant Manager, Du Pont New York office.
Callahan, Charles A., 91 Cushing Street, Waltham, Mass.
Dyer, Waltham Bleachery and Dye Works.
Firsching, Henry, 348 Dill Place, Glendale, L. I.
Colorist, Commonwealth Color & Chemical Company.
Mason, Frederick, 619 Hospital Trust Building, Providence, R. I.
Manager, Newport Chemical Works' Providence office.

The Secretary was instructed to prepare and send out a list of applicants who desire to be elected to membership.

The principal business of the Council meeting consisted in examining the questionnaires, with the object of deciding what subjects could best be chosen from the list submitted, which would be adapted for the prize competition to be offered in the coming Year Book.

In this connection it is interesting to note that there were approximately ninety subjects presented upon the returned questionnaires, and from these it is the purpose of the Council to choose a limited number which will be offered for solution. The entire list of subjects offered will shortly be published in the proceedings, and these should serve as indicative of the type of work which could well receive consideration at local Section meetings.

Very respectfully submitted,
W. E. HADLEY, Secretary.

MEETING OF PHILADELPHIA SECTION

The regular bimonthly meeting of the Philadelphia Section of the American Association of Textile Chemists and Colorists was held on Friday evening, March 2, at the Philadelphia Textile School.

The speaker of the evening was E. B. Kerst, manager of the Providence office of Proctor & Schwartz, Inc., who read a paper on "Dryers in the Textile Industry," an abstract of which follows:

Proceedings of the American Association of Textile Chemists and Colorists

DRYERS IN THE TEXTILE INDUSTRY

Abstract of a Paper by

E. B. KERST

Manager, Providence Office, Proctor & Schwartz, Inc.

In some processes of drying or of releasing water from materials, the drying operation is completed in one operation; that is, the wet material is taken direct to the drying machine without any previous operations, but generally a combination of various methods of abstracting the water in different operations is required.

When the drying is done in more than one operation, the first and simplest operation is that known as drainage, used principally in the drying of hair. Other operations for various materials are settling or precipitation. This is used most commonly for certain chemicals. Filtration, which is an accelerated drainage, is sometimes used for certain chemicals. Absorption, although not very common, is also used, and can be illustrated by the simple operation of absorbing ink onto a blotter. Another operation is that of squeezing, which is used most commonly for raw stock and cloth. The last most common operation is that of centrifuging, which is carried on by means of centrifugal force in a commonly known hydro-extractor. This system is used very widely and is a means by which the highest percentage of water can be extracted from materials previous to the last operation, which is that of evaporation. There are various methods used in evaporation; the oldest, and which possibly gives the best results, is that of outside drying. This method is even used to-day in some few instances for raw stock, cloth, etc., but on account of the uncertainty of the atmospheric conditions and long time that is necessary to complete the drying operation, mechanical dryers have replaced this method.

Two of the main types of mechanical dryers are known as the contact type, of which the can dryer used for warp yarn, cloth, etc., is an example, in which the material comes in direct contact with a heated surface; and also the room or air dryer. There are many varieties of room dryers used upon different kinds of textile and other materials in their many forms. The apron or continuous dryer for loose stock, the tray type of dryer used chiefly for chemicals, dyestuffs, yarn on tubes, and similar materials, the truck dryer used for skein yarn in banks, etc., and the cloth dryers of the different constructions.

In dryer design one of the greatest problems is the proper handling of the materials to be dried. The method of handling will depend, of course, altogether on the type, character, condition and form of material, its previous treatment and the desired condition of the dried product.

Drying by evaporation is based on the one fundamental principle, and that is the conversion of sensible heat into latent heat. Take, for instance, the heat or British thermal units required to evaporate 1 pound of water starting at 52 deg. Fahr. and evaporating at the boiling point of 212 deg. It is known that 160 heat units are required to raise this pound of water from 52 up to 212 deg. This is known as the sensible heat, which can be measured by a thermometer. In order to change this water which has been raised to 212 deg. Fahr. into vapor, 970 B.t.u. are required at 212 deg. Fahr. to convert the water into vapor. This is known as latent heat. The total heat is the sum of these two, or 1,130 B.t.u. As the specific heat of air is only about 0.25, as against 1.0 for water, it will require a change of 4 pounds of air raised 1 deg. or lowered 1 deg. Fahr. This is equivalent to 1 B.t.u., which is the amount of heat required to raise 1 pound of water 1 deg. Fahr. As the volume of air at 80 deg. Fahr. is about 13.5 cubic feet, the volume of air at this temperature can be readily computed to evaporate any quantity of water.

In order to furnish the enormous volume of heated air necessary to dry the material under treatment, fans and heating coils are provided in the usual type of room dryers. Air inlets and exhaust outlets are a step forward in improving the operation of room dryers, and it is found that by the proper control of these openings the best possible results are obtained by reducing or increasing the humidity of the drying air. By the proper control of the dryer temperature and the humidity of the exhaust air, the dryer efficiency is very largely determined, and in the latest types of dryers automatic controls for these features are increased in the dryer itself.

The older types of continuous dryers were built of wood, with the driving shafts mounted on the ceiling. In more recent types an all-steel construction is used, properly insulated, with the shafting mounted on top of the dryer, and all bearings are placed outside of the heated enclosure. Various other improvements have been made, such as the feeding mechanism, sectional conveyors, heat-recovering apparatus, etc.

Textile dryers usually operate at temperatures varying from 150 to 200 deg. Fahr., but are sometimes operated as low as 110 or as high as 290. The temperature depends very largely on the character of the material and the results desired. The percentage of saturation at which it is most economical to discharge the air, the speed of the air in recirculation through the material, the temperature within the enclosure, and the humidity of the drying air all vary very considerably with the material to be dried and the results desired.

Slides illustrating the various types of dryers were shown.

ELMER C. BERTOLET, Secretary.

LIME AND COTTON

(*Continued from page 246.*)

medium pinks, but it is also applicable for mode shades on different mordants.

For lighter shades, the color solution should consist of 5 parts of the dyestuff in paste, stirred up with 45 parts of water, and 875 parts of water, free from lime, 25 parts of ammonia, 25 per cent (1:10), 50 parts of Turkey red oil, 80 per cent (1:44). For dark shades dissolving ether is used in addition to the above ingredients.

Mordants Used for Dyeing Light Shades

Aluminum acetate, 15° Tw.	175 parts		
Acetate of chrome 32.4° Tw.		87 parts	
Acetate of iron, 15° Tw.			250 parts
Acetic acid, 12° Tw. (1:10)	250 "	250 "	250 "
Acetate of lime 28.4° Tw.	50 "	25 "	25 "
Water	9.525 "	9.638 "	9.475 "

It will be noted from all of above what a large and important factor lime is in the dyeing industry which calls so largely for—acetic acid which is distilled from the crude acetate of lime—acetate of aluminum which is produced from acetate of lime and sulphate of aluminum by metathesis or double decomposition—and acetate of lime by itself.

It also seems strange and somewhat paradoxical that, while limes in some form is absolutely essential to the developing of the color of the alizarine dyestuffs, the water used in preparing the various dye baths and mixings must be absolutely without any trace of free lime (or iron, if for reds or pinks).

Now while we have shown that alizarine and aluminum do not combine in the absence of calcium compounds, but that the addition of a lime salt causes the rapid formation of a lake which is probably constituted according to the formula $(C_{14}H_6O_4)_3\,Al_2\,CaO.H_2O$, the lake is not completely formed until the temperature of the dye bath is raised about 158 deg. Fahr.

Lime in Printing Alizarine Red

Alizarine Red for printing steam color is prepared in two distinct ways: (a) By adding the alizarine to a thickening containing all the essential mordants, and (b) by adding the mordants to a paste containing the alizarine.

Alizarine Red (a)—Twenty-seven kilos water, 9.5 kilos starch, 9.5 kilos tragacanth thickening. Boil, cool and add 9.5 kilos oil mordant, 10.5 kilos acetate of lime 23 deg. Tw., 14 kilos tartrate (or oxalate) of tin. When required for printing, 4 parts of the above paste are mixed with one part of alizarine and (for ordinary reds) 2 parts of "paste for reds." Thus: 4 kilos mordant paste, 2 kilos "paste for reds" (sometimes called reduction paste), and 1 kilo alizarine, 20 per cent (yellow shade). For very dark reds the reduction paste may be omitted. Print on oil cloth; steam one and one-fourth hours, with or without pressure; wash, soap and wash.

As the result of many experiments, it has been found that by boiling the alizarine with the thickening and adding the oil mordants hot, a brighter red can be obtained with a smaller quantity of oil and tin compounds than when the latter and the alizarine are added cold. Thus: Alizarine Red (b) (boiled) 47 kilos water, 13 kilos starch, 13 kilos alizarine 20 per cent (yellow shade), 3 kilos acetic acid 9 deg. Tw. Boil, turn off, steam and at once add 2.5 kilos chlor oil, 2.5 kilos stannic hydrate, 20 per cent paste, 2.5 kilos oxalate of tin. Cool and immediately before using add *cold* 3.5 kilos acetate of lime 23 deg. Tw., 4 kilos nitrate of alumina 23 deg. Tw., 10 kilos sulphocyanide of alumina 20 deg. Tw. Print on oiled cloth and steam, wash, soap and wash as before.

Chlor oil is prepared as follows: 100 kilos olive oil, 100 kilos of bleaching powder solution 7.2 deg. Tw. (= 25 grams active chlorine per liter). Stir well until the emulsion is homogeneous

The "paste for reds" (reduction paste) mentioned above is prepared thus: 1,000 grams wheat starch, 7,100 grams water, 500 grams acetic acid 9 deg. Tw., 1,000 grams tragacanth thickening 6 per cent, 400 grams cotton seed oil. Boil and cool.

Alizarine Pink—Six hundred and thirty grams "paste for reds," 100 grams alizarine (blue shade), 140 grams aluminum sulphocyanide 23 deg. Tw., 40 grams acetate of lime 23 deg. Tw., 30 grams oxalate of tin (stannic), 60 grams citrate of alumina 40 deg. Tw. Print on oiled cloth, steam, wash and soap. If the pink is printed as a shirting or other single color, it is usually soaped strongly in the rope form; in other cases it passes through the open soaper at full width as is usual with most steam work. The citrate of alumina mentioned above is made like this: 500 grams hydrate of aluminum, 15½ per cent paste, 220 grams citric acid, 28 grams soda ash, 290 grams water. Stir until dissolved.

Let the dyer and printer *always* remember that in the absence of calcium salts alizarine in the free state does not under any circumstances combine with aluminum hydroxide; goods mordanted with alumina and precipitated with phosphate are not affected by alizarine; if, however, calcium acetate is added to the bath, the formation of a color lake ensues immediately. Acetate of lime is used on all alizarine colors except the blues and greens. It is also used in printing logwood black, thus: 150 grams starch, 100 grams British gum, 400 grams water, 60 grams acetic acid, 25 grams Alizarine X 20 per cent, 30 grams quercitron bark extract 48 deg. Tw., 135 grams logwood extract 48 deg. Tw. Boil and add 16 grams finely ground potassium ferrocyanide, 130 grams nitrate-acetate of chrome 38 deg. Tw., 40 grams acetate of lime 23 deg. Tw. Print on steam as for alizarine reds, then wash and open soap and wash. The chlorate of

soda and yellow prussiate of potash (ferrocyanide) aid in developing the black by oxidizing the logwood during the steaming process.

Acetate of lime is also used in printing catechu drabs or mode shades, thus: 600 grams catechu solution 10 per cent, 240 grams British gum, 100 grams water. Boil and add 20 grams sodium chlorate. Cool and add 30 grams acetate of chrome 30 deg. Tw., 20 grams acetate of lime 23 deg. Tw.

Acetate of chrome is made thus: Liquor (a), 1,200 grams chrome alum, 2,500 grams water. Liquor (b), 1,350 grams acetate of lime, 1,000 grams water or acetic acid solution at 2 deg. Tw. Mix (a) and (b) together, settle and decant the clear and set at 25 to 32 deg. Tw. It will be seen from the above that even when using acetate of chrome as a mordant, acetate of lime is the main factor in its make-up.

Calcium Carbonate—Chalk $CaCO_3$.—In the form of chalk it is sometimes used to neutralize acids, which it does not do to perfection, as an excess of chalk may be present along with free acid. It is also sometimes used in place of acetate of lime in the dye bath with alizarine, though for reasons already given under "acetate of lime" it does not answer so well. It is also used for fixing aluminium and other mordants, for which it answers very well. A light, soft, precipitated *chalk* free from sodium carbonate or hydrate, and which is almost completely soluble in acetic acid, is the best for these purposes.

Calcium Chloride $CaCl_2$.—Calcium chloride is prepared by dissolving lime or chalk in hydrochloric acid. On the large scale it is obtained as a by-product in the manufacture of ammonia-soda ash. Chloride of calcium is very deliquescent, and very easily soluble in water.

It is found in commerce as a white, solid, dense or porous mass. It crystallizes from concentrated solutions as $CaCl_2 + 6H_2O$, and it is to this quality of holding large quantities of water in its crystals that it owes its use in cotton finishing as a conditioning agent. It can be obtained in the form of an anhydrous white solid, containing 36.03 per cent of calcium and 63.97 per cent of chlorine, having the formula $CaCl_2$. While calcium chloride is a very deliquescent substance, it does not equal either the chloride of magnesium or the chloride of zinc in its power of absorbing water. It is obtained as a by-product in alkali manufacture, and is sold both in liquid and solid form. It is cheap enough, answers its purpose very well, and forms an efficient softener and weighting agent. It cannot, however, be mixed with Epsom salts or Glauber salts. These, being sulphates, cause a decomposition, resulting in the formation of insoluble calcium sulphate, which is not wanted. Chloride of calcium is often found to be acid, and all samples should be tested and if this is noted the acidity must be neutralized by adding chalk. The calcium salt is more stable than either the chloride of zinc or of magnesium, not decomposing so readily under the influence of heat. This makes it, of course, much safer to use for cotton goods that have to be heavily but calendered in the finishing processes.

Chloride of calcium has been sold as an antiseptic, but it has no such properties.

The following is an example of size for half-wool flannels or for Canton flannels, showing one method of using chloride of calcium in finishing:

To make 30 gallons of starch, take 60 pounds of potato starch, stir into 10 gallons of cold water, and then add in a thin stream to 10 gallons boiling water with constant stirring. Cool to about 130 deg. Fahr. and add 6 to 8 ounces diastafor dissolved in warm water. Stir well until the paste begins to become thin, then boil up immediately, and while boiling add 25 pounds of glucose, 25 pounds of glue size and 40 pounds of chloride of calcium. The dressing is applied on the back, which is then dried on the hot cylinders, and the nap is then lightly raised. These goods are not pressed.

Recovery of Soap Waste

Chloride of calcium is also used to retrieve the fats and coloring matters from the waste soap liquors which come from the soaping machines in an alizarine dye works. The recovering and utilization of this soap waste is carried out in the following manner: A solution of chloride of calcium is run into the waste soap liquors in a large cistern until no further precipitation takes place, and milk of lime is then added so as to render the solution decidedly alkaline. For this purpose about 43 pounds of quicklime are required for every 20,000 gallons of soap liquor. After thoroughly mixing and allowing it to stand for twelve hours, the clear liquor, which is almost colorless, is drawn off and the precipitate is pumped into a smaller cistern, where it is treated with hydrochloric acid in quantity just sufficient to decompose the lime soap. The liberated fatty acids and the coloring matter which exists as a lake are collected on woolen filters and pressed, at first cold, and then under hot water; by this means nearly all the fat is squeezed out. The pressed cake is then treated in a properly constructed apparatus with light petroleum to dissolve and remove the last traces of fat from the valuable coloring matter, which is finally boiled with diluted sulphuric acid and washed with cold water until free from acid. The coloring matter thus obtained is equal to more than its original weight in dyeing power.

The fatty acids recovered by the above process may be made into soap by boiling with soda ash and used in further soaping operations. Aside from the recovery of the coloring matters and the fatty acids, the supernatant water from the precipitated soap liquor is rendered clean and clear, and may be run off into any stream or canal without polluting it.

CALCIUM SULPHATE, MINERAL, SATIN WHITE $CaSO_4$

Calcium sulphate occurs naturally in the mineral gypsum and selerite, the former being more or less massive and having a crystalline structure, while selerite occurs in flat transparent tables. Both forms contain one molecule of water of crystallization, which by the action of heat can be driven off and the dried gypsum loses its crystalline structure and becomes more or less white, opaque and powdery. The powder has the property of combining with water and sets into a hard, compact mass, and on this property is based the use of plaster of Paris, which is ground calcined gypsum. The mineral gypsum is ground and levigated, and in that form is used by cotton finishers as *mineral* or gypsum, and by painters used the name of *terra alba*.

Satin white is an artificially prepared calcium sulphate obtained by precipitating sulphate of lime in various ways, one method being to precipitate a solution of alum with lime water. The product in this case is a mixture of alumina and calcium sulphate, and is used for finishing special lines of fine cotton goods.

Other compounds of calcium are the sulphocyanide and the oxalate. The sulphocyanide is restricted to the preparation of the corresponding aluminum salt, and the oxalate is empoyed solely as an addition to the chromate discharge colors on Indigo. Oxalate of lime is prepared as follows: Dissolve 1,000 grams of oxalic acid in water and neutralize with about 800 grams of chalk. Wash the precipitate by decantation and then filter and press it until it weighs 2,000 grams. This produces a 50 per cent $Ca(COO)_2$ oxalate of lime. —Textile American.

Dyeing of Wool in Fast Colors

Search for Bright Mordant Colors—Methods of Mordanting—Developments of Indigo Dyestuffs—Effect of Chroming on Strength of Wool Fiber—Fast Acid Colors

By B. WUTH

(Concluded from page 234.)

Shades on mordanted wool never show quite that level, penetrated appearance which otherwise dyed shades show, and this fact renders slower dyeing essential, thus decreasing the rate of production and increasing the expense. The advantages of chrome developing colors are better penetration, increased fastness to rubbing, shorter period of dyeing, and thereby considerabl saving in steam, wages, and amortization of the plant and increase of output. The wool, however, must be well cleansed and free from grease and oil, otherwise poor dyeings result.

The greatest disadvantage of this process is the impossibility of gauging the resulting shade before the development is complete, as the shade of the wool before the development is entirely different from the developed shade. In dyeing a staple shade, such as blue or black, the dyer knows that a certain percentage of dyestuff in a given time reduces the desired effect, and need hardly match off. Fancy shades, however, are more difficult to dye to shade, as the definite shade must be more or less guessed from the undeveloped shade or from a rapidly developed pattern. But for this the chrome developing colors would have found a much larger field of application. Further, a large number of chrome developing colors are, by their chemical nature, sensitive to metal, and change their shades sometimes very considerably if during the dyeing operation they are brought into contact with copper, lead, etc.

None of the processes, however, has yet reached the ideal state. In one case matching is possible during dyeing, but the wool is subjected to a long action of the hot acid liquor; in the other case the dyeing operation is shorter, although it still necessitates two or three hours, which, especially in the presence of chromic acid, cannot be termed beneficial for the wool.

The necessity of using acid in dyeing initially handicapped the introduction of these new methods. The dyer of the old school considered vat dyeing to be the least dangerous for the quality of the wool, and dyed fancy shades by overdyeing an Indigo ground in a neutral bath with wood or Alizarin colors. It is therefore not surprising that they very hesitatingly adopted new methods which were based on boiling the wool with acids for several hours.

DEVELOPMENT OF INDIGO DYES

The development of color chemistry with its large range of colors almost did away with the vatting process, as it was too lengthy. Further, only one vat dyestuff, Indigo, was known at the beginning of the century.

In the year 1897, Bayer and Heumann succeeded in

synthesizing Indigo, and a few years later Sandmeyer made an independent synthesis and, although through unforeseen circumstances, the manufacture by Sandmeyer's process was soon given up, the synthesis itself applied on different lines proved very valuable. In 1902 the Basle Chemical Works, since 1908 amalgamated with the Society of Chemical Industry, found other working processes, and since 1910 has produced Indigo on a large and increasing scale in its works at Monthey.

Like the synthesis of Alizarin, that of Indigo, thirty years later, opened up a new field for the chemist, and the development, leading to red, violet, orange, yellow and even black Indigo dyestuffs, set in rapidly. Basle can claim to be a stronghold of the Indigo derivatives of the present day, as in the laboratories of the Society of Chemical Industry Friedlander discovered Thioindigo Red, the thio-analogue of Indigo, and shortly afterwards Engi began his successful line of work with a new synthesis of thioindigo, the Ciba Pink B. There followed the so-called Vat Blue, the 2-thio-naphthene-2-indo indigo, which, itself of no tinctorial value, proved a valuable intermediate for a number of other dyestuffs of continually increasing importance, namely, the brominated products Ciba Gray and Ciba Violets B and 3B. By a higher bromination of thioindigo, Ciba Bordeaux B was produced, and by modification of the molecule of the product obtained by condensation of oxythionaphthene and dibron-isatine Ciba Red G was arrived at. Ciba Red B was built up by halogen substitution of thioindigo.

Meanwhile the Basle Chemical Works found a pure scarlet vat dyestuff, Ciba Scarlet G, by condensation of acenaphthene-quinone with oxythionaphthene, of which the brominated product is on the market as Ciba Red R.

Effect of Chroming on Strength of Fiber

Strange to relate, the bromination of Indigo itself came after that of thioindigo, and led in 1907 to the tri-, tetra-, etc., bromine derivatives of Indigo, the various Ciba Blues, especially Ciba Blue 2B, likewise discovered by Engi. The same chemist discovered in 1907 Ciba Heliotrope by applying his methods to Indirubine in place of Indigo, and found the first green vat dyestuff as a bromine derivative of betanaphthindigo. In 1910 the first yellow dyeing Indigo vat dyestuff was discovered by Engi and Frohlich by subjecting Indigo to a condensation with benzolic chloride under specific conditions. This pure yellow dyestuff, Indigo Yellow 3G Ciba, can be brominated, whereby the shade is turned to the red side, and the tinctorial strength is noticeably increased. This is Ciba Yellow G.

Thus practically within five years an entire range of indigoidal vat dyestuffs was introduced, a much more rapid development than that of Alizarin or the fast azo colors.

The claim that the chroming methods do not impair the strength of the fiber more than did the old process of topping vat blue in a neutral bath gave rise to minute textile tests, which were carried out with the further object of examining whether prejudice of the dyers against boiling with chromic acid was based on good ground or not. These tests proved first of all that rational vat dyeing in no degree impairs the strength of the fiber, a very natural finding in consideration of the fact that the wool is only treated for a short period in moderately warm and weakly alkaline bath and then washed. Further, the results of these tests show clearly the destructive effect of bichrome, especially in cases in which as in afterchroming, it is added to the acid bath, whereby chromic acid is liberated and acts as a strong oxidizing agent. Thus trade opinion that prolonged boiling with chromic acid is dangerous was corroborated, and the practical dyer would gladly refrain from the use of bichrome if a full range of well working vat colors were available in competition with the chrome colors as regards price, or if acid colors fast to milling were discovered.

The Position of the Acid Colors

It remains to investigate the position of such acid colors as are fast to milling. There certainly are today certain acid colors on the market, such as the Cloth Fast, the Polar, Sulphon, Alphanol, etc., colors, Milling Yellow, Scarlet, etc., which are in their degree of fastness sufficient for many purposes, but hardly for producing fast dyes. The fastness to milling and to steaming are sufficient for the heavy cloth trade, and also the fastness to light and wearing does not meet the requirements of the buyer. It must be understood that no acid color exists which is in every respect equal to a mordant or a vat color, but their number is small and their variety in shade limited, so that they cannot seriously compete with the colors nowadays employed in fast dyeing. With such colors, however, gentlest possible treatment of the wool would be given, and the best results in spinning obtained, and there would be the lowest probability of felting during the dyeing operation. The cares of exact matching would be no greater in producing fast than for loose dyes, for it could be effected by adding small quantities of the original components to the hot bath without fearing unlevel shades. As a further advantage of no little moment would be the increase of production by reducing the duration of dyeing to one to one and one-half hours.

A small group of fast acid colors which meet almost all demands of the fast woolen and worsted trades is already available and the extension of the group may be confidently expected.—Jour. Soc. Dyers & Colourists.

Dyes Imported for Consumption Through the Port of New York During February

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce, in Collaboration with the Chemical Section, U. S. Tariff Commission

The total quantity of dyes imported during February was 191,709 pounds, with an invoice value of $199,640. Of the total quantity imported, 62.6 per cent came from Germany, 26.2 per cent from Italy, 10.4 per cent from Switzerland and the remainder from France, England and Canada.

KEY TO ABBREVIATIONS FOR FOREIGN MANUFACTURERS

1—The Six Leading German Companies

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873. Branches in France and Russia.

B—Badische Anilin-und Soda-Fabrik, Ludwigshafen on the Rhine. Founded 1865. Branches in France and Russia.

By—Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen on the Rhine. Founded 1862. Branches in France and Russia.

C—Leopold Cassella & Co., Frankfort on the Main. Founded 1870. Branches in France and Russia.

K—Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870. Branches in Russia.

M—Farbwerke vorm. Meister Lucius & Bruning, Hochst on the Main. Founded 1862. Branches in France and Russia.

2—The Seven Smaller German Companies

BK—Leipziger Anilinfabrik Beyer & Kegel, Furstenberg near Leipzig. Founded 1882.

GG—Chemikalienwerk Greishem G.m.b.H., Griesheim on the Main. Founded 1881.

CJ—Carl Jager G.m.b.H., Anilinfarbenfabrik, Dusseldorf. Founded 1823.

GrE—Chemische Fabrik Griesheim-Electron, Offenbach on the Main. Founded 1842.

L—Farbwerk Muhlheim vorm. A. Leonhardt & Co., Muhlheim on the Main. Founded 1879. Branch in France.

tM—Chemische Fabriken vorm. Weiler ter Meer, Uerdingen on the Rhine. Founded 1877.

WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—Dutch, Belgian and French Companies

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888.

NF—Niederlandische Farbe-und Chemikalienfabrik Delft, Netherlands (Delft). Founded 1897. Branch in Russia.

LG—Lazard Godchaux, of Brussels. (These products are probably compounded largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)

P—Societe Anonyme des Matieres colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

4—Swiss Companies (all at Basel)

DH—Farbwerke vorm. L. Durand, Huguenin & Co. Founded 1871. Branches in Germany and France.

G—Anilinfarben-und Extract-Fabriken vorm. Joh. Rud. Geigy. Founded 1764. Branches in France, Germany and Russia.

I—Gesellschaft fur chemische Industrie. Founded 1885. Branch in France.

S—Chemische Fabrik vorm. Sandoz & Co. Founded 1887.

5—English Companies

ClCo—The Clayton Aniline Co., Ltd., Clayton, near Manchester. Founded 1876.

CR—Clauss & Co. (formerly Clauss & Ree), Clayton, near Manchester. Founded 1890.

CV—Colne Vale Chemical Co., Milnsbridge, near Huddersfield.

RHS—Read Holliday & Sons, Ltd., Huddersfield. Founded 1830. (Purchases by British Dyes, Ltd.)

BD—British Dyes, Ltd. Founded 1915.

Lev—Levinstein, Ltd., Crumpsall Vale, near Manchester. Founded 1864.

Q—Importations of unknown source, through dealers in colors.

Schultz No.	Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
4	Naphthol Green	1	.....	Germany	100
	Green PXL—(B)				
6	Aniline Yellow—(B)	100	.....	Germany	100
19	Fast Light Yellow	485	.....	Germany	100
	Fast Light Yellow 3G—(By)				
56	Nitrosamine Red Paste—(B)	55	.....	Germany	100
100	Eosamine B—(A)	2,000	.....	Germany	100
117	Erika 2GN—(A)	110	.....	Germany	100
118	Geranine	165	.....	Germany	100
	Geranine G—(By)				
	Brilliant Geranine—(By)				
119	Diamine Rose	100	.....	Germany	100
	Diamine Rose GD—(C)				
154	Palatine Chrome Brown	258	343.50	Germany	100
	Pilatus Chrome Brown RX—(B)				
	Palatine Chrome Brown GGX—(B)				
	Palatine Chrome Brown WRRTX—(B)				
177	Milling Yellow O—(C)	300	.....	Germany	100
220	Palatine Black	4,000	.....	Germany	100
	Wool Black GRF—(A)				

Schultz No.	Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
221	Anthracene Acid Brown	100	.....	Germany	100
	Anthracene Acid Brown G—(C)				
273	Diaminogene Blue	4,827.9	.....	Germany	93
	Diaminogene Blue NA—(C)			Italy	7
274	Diaminogene	441	.....	Italy	100
	Diazo Indigo Blue 2RL—(By)				
296	Cotton Yellow GI—(B)	220	.....	Germany	100
306	Pyramine Orange 3G—(B)	500	.....	Germany	100
319	Diamine Scarlet	33	.....	Italy	100
	Diamine Scarlet B—(C)				
346	Minaxo Red 3BX (Oxamine Red 3BX)—(B)	100	.....	Germany	100
349	Diamine Brown B—(C)	450	.....	Germany	100
358	Diphenyl Red	2,313	.....	Italy	73
	Chloramine Red 8BS—(By)			Germany	17
				France	10
360	Pyramine Orange R	35	.....	Germany	100
	Ingamine Orange R—(B)				
366	Delta Purpurine	441	.....	Italy	100
	Delta Purpurine 5B—(By)				
370	Brilliant Congo R—(By)	110	.....	Germany	100
373	Congo Orange R—(By)	220	.....	Germany	100
411	Benzo Azurine 3G—(By)	22	.....	Germany	100
449	Trisulphon B Conc.—(S)	5,004	.....	Switzerland	100
456	Benzo Fast Blue	2,267	.....	Germany	90
	Benzo Fast Blue 4GL—(By)			Italy	10
485	Benzo Brown G	5	.....	Germany	100
	Brown D39 Extra—(By)				
505	Light Green SF Yellowish—(By)	220	.....	Germany	100
507	Xylene Blue VS Conc.—(S)	3,002	.....	Switzerland	100
515	Methyl Violet	52	.....	Germany	100
	Methyl Violet BB Extra Highly Conc.—(B)				
	Methyl Violet N Blue—(B)				
	Methyl Violet NFB—(B)				
516	Crystal Violet	1	.....	Germany	100
	Crystal Violet Extra—(B)				
523	Fast Green	220	.....	Italy	100
	Fast Green Extra Bluish—(By)				
528	Fast Acid Violet 10B	11	.....	Germany	100
	Fast Acid Violet 10B—(By)				
530	Acid Violet	110	.....	Germany	100
	Acid Violet 3BNO—(B)				
	Acid Violet CIOB—(B)				
539	Soluble Blue	150	.....	Germany	100
	Soluble Blue T—(B)				
	Water Blue—(A)				
545	Patent Blue A	250	.....	Germany	100
	Patent Blue A—(M)				
	Brilliant Acid Blue F—(By)				
546	Cyanol	1,548	2,046.20	Germany	72
				Italy	28
	Glaucol FF—(L)				
	Cyanol FF—(C)				
	Cyanol Extra—(C)				
559	Victoria Blue B	127	.....	Germany	100
	Victoria Blue B Highly Conc.—(B)				
562	Brilliant Wool Blue G Extra—(By)	1	.....	Germany	100

Schultz No.	Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
564	Naphthalene Green V—(M)	551	.....	Germany	100
571	Rhodamine 6G	2,440	8,072.50	Germany	91
	Rhodamine 6GDN Extra—(B)			Italy	9
	Rhodamine 6GDN Extra Conc.—(B)				
	Rhodamine 6GDN Extra Powder—(B)				
573	Rhodamine B	2,599.5	3,936.92	Italy	100
	Rhodamine B Extra—(By)				
	Rhodamine B Extra—(B)				
	Rhodamine B Extra BASF—(B)				
603	Acridine Orange	330	.....	Switzerland	100
606	Phosphine	2,527	3,221.74	Germany	91
	Coriophosphine OX Extra—(By)			Italy	9
	Phosphine 3R—(A)				
	Phosphine O—(M)				
608	Patent Phosphine	465	.....	Germany	100
	Patent Phosphine GRNTN (Euchrysine)—(B)				
	Euchrysine GRNTN—(B)				
	Euchrysine RRX—(B)				
609	Homophosphine	22	.....	Germany	100
	Auracine G—(By)				
613	Quinoline Yellow	476	534.60	France	98
	Quinoline Yellow KT Extra Conc.—(By)			Germany	2
	Quinoline Yellow Conc.—(By)				
	Quinoline Yellow Extra—(B)				
617	Columbia Yellow	1,000	.....	Germany	100
	Chloramine Yellow GG—(By)				
618	Thioflavine T	121	.....	Italy	90
	Rhoduline Yellow 6G—(By)			Germany	10
	Thioflavine T—(C)				
635	Modern Violet	110	.....	Switzerland	100
	Blue 1900 Double Powder—(DH)				
645	Gallazine A	602	.....	Switzerland	100
	Gallazine A Paste Conc.—(DH)				
663	New Methylene Blue	321	.....	Italy	69
	New Methylene Blue N—(C)			Germany	31
	Methylene Blue NNX—(B)				
672	Azocarmine	2,423	.....	Germany	100
	Azocarmine GX—(B)				
735	Pyrogene Indigo	110	.....	Canada	100
	Pyrogene Indigo—(I)				
746	Katigene Green 2G—(By)	1	.....	Germany	100
754	Kurgan Violet (Kyrogene Violet 3RX)—(B)	100	.....	Germany	100
759	Anthraflavone G Paste	2,233.5	2,057.60	Italy	100
	Anthraflavone G Paste—(B)				
	Anthraflavone GC Paste—(B)				
	Anthraflavone GC Powder—(B)				
760	Indanthrene Golden Orange G	4,502	3,592.35	Italy	70
	(single strength)			France	30
	Indanthrene Golden Orange G Dble. Pst.—(B)				
	Indan. Golden Orange G Dble. Pst. Fine—(B)				
	Indanthrene Golden Orange G Powder—(B)				
761	Indanthrene Golden Orange (single strength)	2,958	4,129.12	Italy	100
	Indanthrene Golden Orange RRT—(B)				
	Indanthrene Golden Orange RRT Paste—(B)				
	Indanthrene Golden Orange RRT Pdr.—(B)				
	Indanthrene Golden Orange RRTS Pdr.—(B)				

Schultz No.	Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
762	Indanthrene Scarlet GS Powder—(B)	220	.....	Germany	100
765	Indanthrene Green B (single strength)	10	.....	Germany	100
	Vat Blue Green B Double Paste—(B)				
767	Indanthrene Violet RR	2,147	2,003.51	Italy	95
	(single strength)			Germany	5
	Indanthrene Violet 2R Extra Powder—(B)				
	Indanthrene Violet RR Paste Extra—(B)				
	Vat Bril. RR Pst. (Indan. Violet RR)—(B)				
790	Anthracene Blue	427	.....	Germany	100
	Anthracene Blue SWGG Extra Powder—(B)				
	Anthracene Blue SWR Powder—(B)				
800	Anthracene Blue 3G	379	.....	Germany	100
	Anthracene Blue WG Paste—(B)				
807	Alizarine Black S	980	.....	Germany	100
	Alizarine Black S Paste—(M)				
811	Algol Yellow 3G	619	.....	Germany	64
	Vat Yellow 3G Paste—(By)			Italy	36
	Algol Yellow 3GL Paste—(By)				
812	Indanthrene Orange RT	4,000	.....	Germany	100
	Vat Orange RRT Paste—(B)				
817	Algol Yellow R	3,660	2,919.95	Germany	68
	(single strength)			Italy	32
	Algol Yellow R Powder—(By)				
	Vat Yellow GK Pst. (Algol Yellow R)—(By)				
	Vat Yellow GP (Indanthrene Yellow)—(By)				
819	Algol Red RFF	4,928	.....	Germany	80
	(single strength)			Italy	20
	Vat Red R Extra Powder—(By)				
	Algol Brillian Red BB Powder—(Q)				
821	Algol Brilliant Violet	5	.....	Germany	100
	Vat Brilliant Violet BBK Paste—(By)				
822	Algol Brilliant Orange FR (single strength)	880	.....	Germany	100
	Algol Brilliant Orange FR Powder—(By)				
824	Algol Orange R	1,680	.....	Italy	99
	(single strength)			Germany	1
	Algol Orange R Powder—(By)				
831	Indanthrene Red BN	1,567	.....	Italy	58
	(single strength)			Germany	42
	Indanthrene Red BN Extra Paste—(B)				
	Vat Red RK Paste Fine—(B)				
837	Indanthrene Blue R	176	.....	Italy	100
	Indanthrene Blue R Powder—(B)				
842	Indanthrene Blue GCD	3,762	1,990.59	Italy	63
	(single strength)			Germany	37
	Indanthrene Blue GCD Paste—(B)				
	Indanthrene Blue GCD Double Paste—(B)				
	Vat Blue GCD Double Paste—(B)				
844	Algol Blue 3G (single strength)	729	.....	Germany	100
	Vat Blue 5G Paste—(By)				
	Algol Blue 3G Paste—(By)				
	Algol Blue 3G Powder—(By)				
849	Indanthrene Yellow	7,470	3,794.60	Germany	80
	(single strength)			Italy	20
	Indanthrene Yellow G Paste—(B)				
	Indanthrene Yellow G Powder—(B)				
	Vat Yellow G Double Paste—(B)				
	Vat Yellow G Double Paste Fine—(B)				

Schultz No.	Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
852	Alizarine Irisol DR	102	.....	France	99
	Alizarine Blue JR Powder—(By)			Germany	1
	Alizarine Irisol R—(By)				
853	Anthraquinone Violet Powder—(B)	50	.....	Germany	100
854	Alizarine Viridine FF	8,999	.....	Germany	100
	Alizarine Viridine FF Paste—(By)				
855	Alizarine Pure Blue	230	.....	Italy	56
	Alizarine Sky Blue B—(By)			Germany	44
	Alizarine Sky Blue B Powder—(By)				
856	Alizarine Astrol	4,018.6	7,873.11	Germany	56
	Alizarine Astrol B Powder—(By)			England	28
	Alizarine Rubinol R Powder—(By)			Italy	16
	Alizarine Rubinol 5G Powder—(By)				
	Alizarine Rubinol 3G Powder—(Q)				
858	Alizarine Saphirol B	2,538.5	4,700.44	Italy	41
	Alizarine Saphirol B—(By)			France	30
	Alizarine Saphirol SE—(By)			Germany	29
	Alizarine Saphirol SE Powder—(By)				
	Alizarine Saphirol WSA—(By)				
	Aliz. Blue SAF Pdr. (Aliz. Saph. SE)—(By)				
859	Cyananthrol RXO	300	.....	Germany	100
860	Cyananthrol G	220	.....	Italy	100
	Cyananthrol BGAOO—(B)				
861	Anthraquinone Blue SR Extra Powder—(B)	50	.....	Germany	100
862	Alizarine Blue Black (single strength)	14,944	.....	Germany	100
	Alizarine Blue Black B Powder—(By)				
	Alizarine Blue Black BT Powder—(B)				
863	Anthraquinone Bluish Green BXO Pdr.—(B)	110	.....	Germany	100
864	Anthraquinone Green GXXO	150	.....	Germany	100
	Anthraquinone Green GXXO Powder—(B)				
	Anthraquinone Green GXXO—(B)				
865	Alizarine Direct Green G	4,000	.....	Germany	100
	Alizarine Cyanine Green G Ex. Pdr.—(By)				
867	Indanthrene Brown (single strength)	1,524	.....	Germany	100
	Anthra Brown B Double Paste—(B)				
873	Helindone Brown	1,115	.....	Italy	60
	Anthra Pink B Extra Paste—(B)			Germany	40
	(Indanthrene Pink B Extra Paste)				
	Indan. Red Brown R Ex. Pst. BASF—(B)				
885	Brilliant Indigo	6,653	.....	Germany	100
	Brilliant Indigo B Paste				
886	Brilliant Indigo GD	400	.....	Germany	100
	Brilliant Indigo G Paste—(B)				
890	Ciba Yellow G	662	.....	Switzerland	100
	Ciba Yellow G Paste 10%—(I)				
896	Helindone Blue 3GN (single strength)	3,990	.....	Italy	100
	Helindone Blue 3GN Powder—(M)				
901	Ciba Violet B	2,209	.....	Switzerland	100
	Ciba Violet R Paste 10%—(I)				
902	Helindone Brown 2R	165	.....	Italy	100
	Thio Indigo Brown R Powder—(K)				
910	Helindone Pink	1,602	.....	Italy	69
	Thio Indigo Pink BN Extra Paste—(K)			Germany	31
913	Helindone Orange R Powder—(M)	101	.....	Italy	100
	Helindone Fast Scarlet R Paste—(M)				
915	Helindone Fast Scarlet RR	50	.....	Germany	100
	Helindone Red B Paste—(M)				

Schultz No.	Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
917	Helindone Red B	50	.....	Germany	100
918	Helindone Red 3B	3,858.5	2,472.32	Italy	98
	(single strength)			Germany	2
	Helindone Red 3B Paste—(M)				
	Helindone Red 3B Powder—(M)				
	Thio Indigo Red 3B Powder—(M)				
	Vat Red Violet RH Pst. (Helin. Red 3B)—(B)				
923	Ursol	264	353.55	Germany	100
	Fur Brown PY—(A)				
	Fur Brown SO—(A)				
	Fur Dye DF—(A)				
	Fur Dye NZ—(A)				
	Fur dye NZD—(A)				
	Fur Dye SB—(A)				
	Fur Dye SLA—(A)				
	Fur Dye SK—(A)				
	Fur Dye SKG—(A)				
	Fur Dye SP—(A)				
	Fur Dye 4G—(A)				
	Fur Dye 4R—(A)				
	Fur Gray AL—(A)				
	Fur Gray B—(A)				
	Fur Red Brown 6R—(A)				

UNIDENTIFIED ACID DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Acid Milling Yellow G Conc.—(S)	100	.....	Switzerland	100
Acid Violet 4RNOO—(B)	100	.....	Germany	100
Alizarine Direct Violet ER Powder—(B)	200	.....	Germany	100
Alizarine Light Blue B Conc.—(S)	1,276	.....	Switzerland	100
Anthra Cyanine Brown GL—(By)	55	.....	Germany	100
Azo Cyanine GR—(Q)	100	.....	Germany	100
Brilliant Milling Blue—(Q)	100	.....	Germany	100
Brilliant Pure Yellow 6G Extra—(By)	10	.....	Germany	100
Kiton Fast Red 4BL Conc.—(I)	250	.....	Switzerland	100
Minaxo Acid Brown G (Oxamine Acid Brown)—(B)	500	.....	Germany	100
Palatine Light Yellow RX—(B)	211	.....	Germany	100
Special Blue G—(B)	100	.....	Germany	100
Supremine Red B—(Q)	1	.....	Germany	100
Supremine Yellow R—(By)	200	.....	Germany	100
Wool Fast Blue—(B)	235	.....	Germany	100
Wool Fast Blue BL—(B)				
Wool Fast Blue GL—(By)				
Wool Fast Orange G—(B)	50	.....	Germany	100
Wool Fast Red BL—(By)	24	.....	Germany	100
Wool Fast Yellow 3G—(B)	100	.....	Germany	100

UNIDENTIFIED VAT DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Algol Brown G Powder—(By)	11	.....	Germany	100
Helindone Black Blue 1	11	.....	Germany	100
Helindone Blue IGCD Double Paste—(M)	50	.....	Germany	100
Helindone Blue Green IB Double Paste—(M)	50	.....	Germany	100
Helindone Dark Blue LBOA Paste—(M)	524	.....	Italy	100
Helindone Golden Orange IRRT Paste—(M)	50	.....	Germany	100

UNIDENTIFIED VAT DYES—(Continued)

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Helindone Pink R Extra Paste—(M)	5,000	.....	Germany	100
Helindone Violet IRR Paste (extra)—(M)	50	.....	Germany	100
Helindone Yellow AGC Paste—(M)	50	.....	Germany	100
Hydron Brown G Paste—(C) R Paste—(C)	404	.....	Germany	100
Hydron Green B Paste—(C) G Paste—(C)	300	.....	Germany	100
Hydron Navy Blue C Paste 30%—(C)	6	.....	Germany	100
Hydron Olive GN Paste—(C)	1	.....	Germany	100
Hydron Pink Hydron Pink FB Paste—(C) Hydron Pink FF Paste—(C)	1,564	.....	Italy	100
Hydron Yellow NF Paste—(C)	750	.....	Germany	100
Indanthrene Blue Indanthrene Blue BO Extra Paste—(B) Indanthrene Blue BO Powder—(B) Indanthrene Blue RC Paste—(B) Indanthrene Blue RC Powder—(B) Indanthrene Blue RO Paste—(B)	4,706	.....	Italy	100
Indanthrene Violet BN Extra Paste—(B)	2,204	.....	Germany	100
Thio Indigo Pink RN Extra Paste—(K)	2,215	.....	Italy	100
Thio Indigo Rose RN Extra Paste—(K)	500	.....	Germany	100
Thio Indigo Violet Thio Indigo Violet 2R Paste—(K) Thio Indigo Violet 2R Powder—(K)	693	.....	Italy	100
Vat Blue REZ Powder (Indanthrene Blue)—(B)	25	.....	Germany	100
Vat Brown R Powder (Indan. Brown R Pdr.)—(By)	440	.....	Germany	100
Vat Gray 3B Dble. Pst. (Indan. Gray 3B)—(B)	200	.....	Germany	100
Vat Red RKP Pdr. (Indan. Red RKP)—(B)	100	.....	Germany	100

UNIDENTIFIED MORDANT AND CHROME DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Acid Chrome Blue Acid Chrome Blue BH—(Q) Acid Chrome Blue 2R—(Q)	22	.....	Germany	100
Alizarine Geranole B Powder—(Q)	804	.....	Germany	100
Chromacetine Blue S Powder—(DH)	441	.....	France	100
Chrome Violet CG Powder—(DH)	110	.....	France	100
Chromorhodine BR Powder—(DH)	55	.....	France	100
Diamond Bordeaux R—(By)	1	.....	Germany	100

UNIDENTIFIED SULPHUR DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Katigene Yellow Brown GR Extra—(By)	.....	.....	Germany	100
Pyrogene Indigo Blue—(Q)	110	.....	Canada	100
Thional Yellow GG—(S)	1,102	.....	Switzerland	100

UNIDENTIFIED BASIC DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Brilliant Acridine Orange A—(DH)	110	.....	Switzerland	100
Fast Marine Blue HBTA—(B)	500	.....	Germany	100
Keb Janus Black I—(Q)	25	.....	Canada	100
Methylene Blue 3G—(B)	50	.....	Germany	100
Rhoduline Blue	44	.....	Germany	100
Rhoduline Blue GO—(By)				
Rhoduline Blue 3GO—(By)				
Rhoduline Sky Blue 3G—(By)	22	.....	Germany	100

UNIDENTIFIED SPIRIT SOLUBLE AND COLOR LAKE DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Helio Bordeaux BL Paste—(By)	251	.....	Germany	100
Helio Fast Violet AL—(By)	7	.....	Germany	100
Tero Black FB (Typophorblk. FB)—(B)	5	.....	Germany	100
Tero Brown FR (Typophor Brown FR)—(B)	5	.....	Germany	100
Tero Yellow FR (Typophor Yellow FR)—(B)	5	.....	Germany	100

UNIDENTIFIED DIRECT DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries	
Aceto Purpurine 8B—(A)	1,376	.....	Italy	100
Benzochrome Brown B—(By)	11	.....	Germany	100
Benzo Copper Blue 2B—(By)	110	.....	Germany	100
Benzo Fast Black L—(By)	400	.....	Germany	100
Benzo Fast Brown	609	.....	Germany	100
Benzo Fast Brown RL—(By)				
Benzo Fast Brown 3GL—(By)				
Benzo Fast Eosine BL—(By)	33	.....	Germany	100
Benzo Fast Heliotrope	110	.....	Germany	100
Benzo Fast Heliotrope BL—(By)				
(Brilliant Benzo Fast Violet)				
Benzo Fast Heliotrope 5RH—(By)	.....	.....	Germany	100
Benzo Fast Rubine BL—(By)	22	.....	Germany	100
Benzo Light Orange 2R—(Q)	199	.....	Italy	100
Benzo Rhoduline Red B—(By)	330	.....	Germany	100
Brilliant Benzo Violet 2R—(By)	220	.....	Germany	100
Brilliant Fast Blue B—(By)	55	.....	Germany	100
Brilliant Sky Blue 8G Extra—(By)	1,510	.....	Germany	100
Carbazol Yellow W Powder—(Q)	10	.....	Germany	100
Cotton Pink	330	.....	Germany	100
Cotton Pink BN—(B)				
Cotton Pink GN—(B)				
Cotton Pink RN—(B)				
Diamine Fast Blue FFB—(C)	9	.....	Germany	100
Diamine Fast Violet	440	.....	Germany	100
Diamine Fast Violet FFBN—(C)				
Diamine Fast Violet FFRN—(C)				
Diazanil Pink B—(M)	50	.....	Germany	100
Diazo Brilliant Scarlet 6B—(By)	1,278	.....	Germany	100
Diazo Brown 3RB—(By)	5	.....	Germany	100
Diazo Dark Blue 3B—(Q)	284	.....	Germany	100
Kiazo Indigo Blue 4GL Extra—(By)	425	.....	Germany	100
Diazo Rubine B—(By)	359	.....	Germany	100
Diazo Sky Blue 3G—(By)	24	.....	Germany	100
Diazogene Red B—(Q)	300	.....	Germany	100
Direct Brown 5G—(I)	2,205	.....	Switzerland	100

UNIDENTIFIED DIRECT DYES—(Continued)

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries
Direct Fast Orange K (Triazol Orange G Conc. 125%) —(I)	1,000	.....	Switzerland 100
Minaxo Fast Blue RRX (Oxamine Fast Blue RRX) —(B)	10	.....	Germany 100
Minaxo Light Red E8B (Oxamine Light Red E8E) —(B)	200	.....	Germany 100
Ozydiaminogene—(C)	50	.....	Germany 100
Pyrazol Orange	200	.....	Switzerland 100
Pyrazol Orange R Conc.(S)			
Pyrazol Orange RR Conc.—(S)			

UNIDENTIFIED, UNCLASSIFIED, SPECIAL DYES

Name of Dye and Manufacturer	Quantity Pounds	Value Dollars	Per Cent by Countries
Katanol—(By)	4,559	.....	Germany 100
Modern Royal Blue Powder—(DH)	110	.....	Switzerland 100
Paper Fast Bordeaux B—(By)	537	.....	Germany 100
Poseidon Blue BXX—(B)	1	.....	Germany 100
Thio Violet 5R Powder(DH)	55	.....	Switzerland 100

DYEING KNITTING YARNS

(*Continued from page 240.*)

wide variety of shades. To these can be added for completeness—

Wool Violet 4BN.
Fast Crimson GR.
Alphazurine A.
Fast Fuchsine 6B.
Cloth Red B.
Rhodamine B.
Wool Orange A Conc.
Alphazurine 2G.

while for certain particular shades use may be made of—

Acid Fast Violet BG.
Acid Magenta N.
Alizarine Sapphire, and
Cloth Reds G, R and 2R.

Three general methods are employed for applying these dyes to knitting yarns, the most commonly used being with oil of vitriol and Glauber salt. For a batch of 100 pounds of yarn, the dye bath is charged with 15 to 20 pounds of crystal Glauber salt, and with one pint to one quart of oil of vitriol, according to depth of shade. The bath is heated to 115 or 120 deg. Fahr., the yarn entered, and brought to the boil in about half an hour, and boiling continued for about an hour additional, or until the bath appears to be exhausted. Boiling of the yarn in a spent dye bath serves no useful purpose, besides aiding in felting. After the shade is obtained, the yarn must be rinsed clean of all remaining traces of acid; any that remains causes the hanks to possess a harsh feel or handle which knitting yarns should not have.

The dyes that are best adapted to the foregoing method of dyeing are Alizarine Sapphire and Alizarine Sapphire FS, Fast Crimson GR, Wool Orange 2G Crystals, Alphazurine A and Alphazurine 2G, Wool Yellow Extra Conc., Fast Crimson 6BL, Fast Fuchsine 6B, Rhodamine B, Acid Fast Violet BG, and Buffalo Black SB.

Some shades requiring certain other dyes make use of acetic acid and Glauber salt only, the batch being prepared for 100 pounds of yarn with 15 to 20 pounds Glauber salt, and one and one-half quarts acetic acid (28 per cent strength). The hanks are entered into the bath at 120 deg. Fahr., heated slowly to the boil, and boiled for half an hour. Cold water is slowly added to the batch to lower its temperature, and afterwards one to two quarts of acetic acid, again raise to boil, and continue for half an hour longer, or until the desired shade is obtained, or the bath exhausts. The dyes to be used for this process are Cloth Reds GR, 2R, and B, Wool Violet 4BN, and when used with those named in paragraph above, Wool Orange A Conc.

The third method of dyeing knitting yarns certain other shades is with the aid of both acetic acid and oil of vitriol. For 100 pounds of yarn the bath is prepared with 15 to 20 pounds Glauber salt and one to two quarts acetic acid (28 per cent strength). Enter at 120 deg. Fahr., slowly bring to the boil and boil for half an hour. Afterwards cool the bath by the gradual addition of cold water and add one-half to one pint of oil of vitriol, again raise to the boil, and continue until the bath exhausts or the shade is obtained. There are but few dyes that require the use of the two acids mentioned, they are Wool Violet 4BN, Fast Fuchsine 6B, Wool Orange A Conc., Acid Magenta N, and Rhodamine B.

While recipes are available for matching standardized shades, it becomes necessary for the dyer to keep a watchful eye on the dyeings, since slight variations in either the yarn to be dyed or the water used in dyeing may greatly influence the shade.

Dyeing raw wool heavy shades, to be used in making heather mixtures, should be done with chrome-mordant

dyes. This requires that the wool be well scoured and rinsed before mordanting, otherwise the dyeings may not be fast to crocking, however good they may otherwise be. Chrome mordanting is effected in the following manner: The clean wool is boiled for one to one and one-half hours in a bath prepared with from 1 to 4 per cent of bichromate of soda, and 1 to 3 per cent of crude argol or cream of tartar, and then rinsed. The wool is then ready to be dyed with such colors as are suitable, among which are a number available for heather knitting yarn from the superchrome, alizarol and closely allied groups.

Other chrome dyeing processes are also used, one requiring the addition of bichromate to the spent dye bath after the wool has been dyed, and the other, known as the "chromate" process provides for the dye and bichromate being used together in the same bath. The use of any of these processes is largely a matter of personal choice on the part of the dyer. For the very best results fastness of properly selected dyes on raw wool, the first mentioned mordanting process appears to be most in favor. As in dyeing, so in mordanting, especially in chrome-mordanting, the chief point to be kept in mind is to preserve the luster and elasticity of the wool.

Foreign Trade Opportunities

Reserved information may be obtained from the U. S. Bureau of Foreign and Domestic Commerce and its district and co-operative offices by duly registered firms and individuals upon written request by opportunity number. The bureau does not furnish credit rating or assume responsibility as to the standing of foreign inquirers; the usual precautions should be taken in all cases, and where no references are offered it does not necessarily imply that satisfactory references could not be given. Correspondence may be in English unless otherwise stated. Symbols: *Reported by American consular officers; †Reported by commercial attaches and trade commissioners; ‡Direct inquiries received by the Bureau.

4678†—*Hosiery* of all kinds, hats, and garters—Chile. Agency desired.

4684†—*Down quilts*—Denmark. Purchase desired. Quotations, c. i. f. Danish port. Terms: Payment against documents.

4707*—Newsprint and wrapping paper, stationery, notions, *cotton, silk,* and *wool textiles,* chemical products, paints, oils, and varnishes—Brazil. Agency desired. Quotations, c. i. f. Recife.

4713‡—*Textile goods* and *yarn*—England. Agency desired.

4726‡—Hardware, tool and spring steel, mild steel and basic steel plates, metal sheets, brass and copper rods and tubes, boiler fittings, machinery and tools, cotton mill and railway stores, electrical apparatus, provisions, glassware and crockery, cutlery, galvanized and other wires; automobiles, motor cycles, and bicycles, and their accessories; *piece goods, woolen goods,* fents, second-hand clothing, boots and shoes, etc.—India. Purchase and agency desired. Quotations, c. i. f. port of India.

4747†—*Cotton goods, knit goods, etc.*—Denmark. Agency desired. Quotations, c. i. f. Danish port.

4756‡—*Knit underwear* and *hosiery*—Canada. Representation of manufacturers desired.

5069*—*Artificial-silk and cotton hosiery* of a cheap grade, and fleece-lined underwear, from the best to the cheapest grade—Belgium. Purchase from manufacturers. Quotations, c. i. f. Antwerp.

5073*—*Raw cotton yarns* and *cotton cloth*—Germany. Representation of spinning and weaving mills. Quotations, f. o. b. New York, or c. i. f. (in bond) Hamburg. Terms: Cash against documents.

5075*—Gray sheetings, 26 inches, and *colored suitings* (drills), 26 inches—Honduras. Agency from manufacturers. Quotations, f. o. b. American port.

5079†—Felts and beaver for hats, birds of paradise and other trimmings for women's hats, visors for caps, jipi japa hats, and *silk dress goods* of all kinds—Spain. Agency.

5081*—Plumbing fixtures and bathroom supplies, and *raw cotton*—Norway. Agency. Quotations, c. i. f. Norwegian port. Terms: Cash against documents.

5083*—*Hosiery* and rubber combs—Sweden. Agency. Quotations, f. o. b. New York.

5122*—*Cotton goods, hosiery, knit goods,* and thread for knit goods—Uruguay. Agency from manufacturers.

5123†—Men's neckwear, *silk, cotton and knit clothing; light weights and summer clothing for men and boys; children's dresses and rompers; cotton, lisle, and silk hosiery;* and women's clothing—Cuba. Agency. Quotations, f. o. b. American port.

4595*—*Cotton and woolen yarn,* jute for bags, chemicals, leather belting, and other articles suitable for the Scandinavian market—Sweden. Purchase and agency desired. Quotations, c. i. f. Goteberg. Terms: Payment against documents.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
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POOR JOURNALISM

IN its February issue our neighbor the Textile Colorist has some rather harsh things to say of "the present tariff monstrosity" and the "ridiculous manner of endeavoring to reach a mutually satisfactory agreement between the (dye) manufacturers, the importers, and the consumers" by means of conferences with customs officials.

Those who have perused the editorial in question have probably learned some interesting things about what goes on among the several parties to this controversy. They are informed, for example, that "the dyestuff manufacturers, the importers, and the consumers are all spending fruitless efforts in an attempt to solve an impossible problem." They may learn of the dyestuff manufacturers that "they demanded a high rate of duty, they demanded American valuation, they demanded an additional rate of duty for competitive products, they demanded that the President should have the power to increase the rates of duty, they demanded both a special and an ad valorem rate of duty—and they received them all."

Most remarkable indeed are the uses to which the English language may be put by those who know how. Pray, notice in the above the skillful substitution of "demanded" for "petitioned"—and the number of times the word is used in a single paragraph. Notice how it is repeated again and again until the reader has a vivid mental picture of those manufacturers advancing inexorably upon Washington, shouldering Congressmen and Senators roughly aside, and "demanding" everything in sight. Viewed in an analytical frame of mind, is not the whole thing just a little bit ridiculous? One does not get things from Congress in that way, even if he is fool enough to try.

However, the paragraph might pass for a comparatively harmless and even permissible rhetorical flight were it not for the fact that it is obviously intended to place the dye manufacturers in an utterly false light. It was clearly planned to throw up about them an atmosphere of arrogance, selfishness, ignorance and ruthlessness—else a different manner of writing would have been employed.

But that is only the beginning. Aside from its crude attempt to arouse consumer hostility, this paragraph is not wanting in far graver indecencies. These take the form of downright misstatements of fact, and whether these misstatements are due merely to gross carelessness, or to causes less innocent, they should not be allowed to pass unchallenged.

Whose memory is so short that he can unblushingly assert, "They demanded a high rate of duty"? We were under the impression that the manufacturers asked for the protection of the interests of dye consumers by low rates of duty, and of their own interests by means of a limited embargo which would permit the importation, under low duty, of anything consumers could not get here upon reasonable terms as to price, quality and delivery; and that it was the representatives and leading spokesmen of the importers themselves who declared for high duty rates, and high duty rates alone, as the ideal protection of the interests of all three classes.

What the manufacturers *got* was high duty protection. The paragraph under discussion says so, and it is right. The dyestuff consumers also "got" the high rates of duty. We'll agree that the consumers and manufacturers both got high duty rates—but the manufacturers never advocated them.

The paragraph likewise says that the dye manufacturers received an affirmative answer to their "demand" that the President should have the power to increase the rates of duty. In view of the well-known fact that out of the entire measure the two paragraphs dealing with coal-tar chemicals were alone made the subject of a ruling that the President could not increase the duty on products listed therein, such a statement reveals with striking clarity the animus which called it forth.

Other instances of greater or lesser departures from the strict facts of the case might be pointed out were it our purpose to lay a charge of carelessness at the door of the Textile Colorist. But with this we have no real concern. The point we wish to make just now is that under the pretext of giving helpful advice for the solution of the present dyestuff importation difficulties, the Textile Colorist apparently tries to see how far it can go in laying the blame for these difficulties on the shoulders of American dye manufacturers. An impartial judge, after reading the entire editorial referred to, would, we believe, decide that an attempt had been made to place the manufacturers in a bad light with dye consumers.

Common sense would tell anyone that neither manufacturers nor importers, both being groups of busi-

ness men, would deliberately try to injure their customers.

All honest attempts to help find the best mode of administering the present tariff law will be welcomed by everyone. But it is seriously to be doubted whether, by its uncalled-for efforts to make the American dye manufacturer the sole goat, the Textile Colorist has succeeded in being at all helpful.

In fact, such tactics as the February editorial appears to reveal are not only poor policy but likewise poor journalism, and would far better be discarded in favor of something really constructive.

ANENT "THE WARNING OF THE RUHR"

WE have received the following letter from Joseph Bancroft & Sons Company, manufacturers, bleachers, dyers and finishers, of Wilmington, Del.:

To the American Dyestuff Reporter:

Respected Friends: We were very much interested in reading your editorial "The Warning of the Ruhr" in the February 26 issue of The Reporter. While we quite agree with the editorial in the main, still the fact remains that no provision has as yet been made for a certain line of dyes—that is, vat dyes—which have and are being more called for than ever. As yet we have no Browns, Oranges, Reds or Pinks to keep up the line which we have started with our trade.

We must, therefore, take exception to this part of the editorial which reads:

"American dye consumers had a bitter lesson, accompanied by many painful results, when the World War broke out in 1914. Once again that lesson is being read to us, this time without pain and in the form of a warning of what we may expect—or rather, what we may not expect—from Europe. That which we may not expect is anything like regularity and attention to business.

"During the distressing dye shortage of 1915-16, it would have seemed almost unbelievable that within a few short years the time would come when news of another stoppage of German dye imports could be received rather as an interesting news item than as a cause for grave fears on the part of textile makers."

If you were in a position of having to furnish some of the above dyes to keep a large plant going to satisfy the above demands, when the plant is already away behind in deliveries, you would readily appreciate why this part of the editorial referring to "being able to take care of ourselves" has been objected to.

Wilmington, March 15, 1923.

While it is quite true that the line of vat colors is incomplete, it is interesting that this is the only exception taken to the general statement that we are practically independent of foreign dyes. The American industry has done remarkably well to get where it has in so short a time. If the question of protection had been quickly settled when the Longworth bill was first introduced, we should probably have had a complete line by now, as research would not have been halted. Incidentally, vat reds are the least valuable of the Indanthrene series, and the main efforts of the industry have been concentrated on the most important items.

However, The Reporter has never taken the position that we "have arrived," and has always insisted that until we not only duplicated *everything* Europe has to offer but went them one better and had *better original* products of our own we could not claim to be truly independent. There is much still to be done, but with the confidence and co-operation of the consumer we shall eventually arrive.

CORRECTION

In the issue of March 12, page 216, Proceedings page No. 84, Mr. Christison was reported to have read a letter from H. A. Mereness giving a formula for a testing solution used on silk to imitate the action of perspiration.

This formula was incorrectly given and should have been as follows:

Water	1,000.0 grams
Potassium sulphate	1.0 gram
Sodium ammonium phosphate	1.5 grams
Phosphoric acid	Trace
Sodium chloride	7.0 grams

Two pieces of white wool felt are soaked in a warm solution of the above and the piece of goods or yarn to be tested is placed between. The whole is then folded tightly around a large beaker in which water is maintained at 100 deg. Fahr. or slightly higher. The wool felt is held to the beaker by rubber bands.

A. C. S. DYE DIVISION WANTS FACTS ON AMERICAN INDUSTRY PRIOR TO 1914

The spring meeting of the American Chemical Society will be held with the New Haven and Connecticut Valley Sections at New Haven, Monday, April 2, to Saturday, April 7, inclusive. All divisions and sections are planning extensive meetings with the exceptions of the divisions of Fertilizer Chemistry and Leather Chemistry. The local committees have nearly completed their arrangements, and an interesting program, together with instructive excursions, is assured. It is hoped to have three thousand members present.

The dedication of the Sterling Chemistry Laboratory of Yale University will be held on Wednesday, April 4, and all members of the society are invited to attend the ceremonies and to inspect the splendid new building.

The Division of Dye Chemistry considers this an opportune time to describe and record the accomplishments and the trials of the American dye industry

prior to the war, and accordingly there has been arranged a symposium on "The Coal-Tar Dye Industry in the United States Prior to 1914." The Secretary of the Division, R. Norris Shreve, 43 Fifth Avenue, New York City, asks anyone who has any facts bearing on this matter to write him at once. A complete picture is desired.

REGARDING "HANDY GRAPHICS"

Owing to last-minute pressure, the final instalment, Part VII, of the "Handy Graphics" series by Charles F. Goldthwait and John E. Hoff, has been omitted from this number. It will be given in the issue of April 9.

INQUIRY DEPARTMENT

All classes of chemical work or advice relating to artificial colors, natural dyestuffs, dyewoods, raw materials, extracts, intermediates, crudes, or dyeing chemicals and accessories in general, will be carried out for readers and subscribers of the AMERICAN DYESTUFF REPORTER by this department.

Inquiries of a minor character will be answered on this page, while major matters involving personal investigation, analyses, perfected processes and working formulas, will, if desired, be treated confidentially through the mails. In answering inquiries which, by their nature, require reference to the products, processes or apparatus of some particular manufacturer we aim to be absolutely impartial. We refer the inquiries to specialists whom we believe to be best qualified to answer them intelligently, and must disclaim responsibility if their reports show unintentional bias. All questions, materials for analysis or letters leading to the opening of negotiations for special work will receive prompt attention if addressed to Inquiry Department, American Dyestuff Reporter, Woolworth Building, New York City.

D. V. M.—*Question:* Among the many interesting articles that we have lately found in the AMERICAN DYESTUFF REPORTER is the one in the issue of December 4, 1922, page 436, entitled, "Fermasol, New Diastasic Preparation of Animal Origin." We would appreciate your sending us the name and address of the manufacturer of this material. In case you know of more than one, we would appreciate the names and addresses of all that you know.

Answer: Fermasol is a patented product manufactured solely by the Sandoz Chemical Works, whose New York address is 240 Water Street.

W. H. H.—*Question:* We would like to know whether or not there is any simple test for determining the money value of soap without resorting to an analysis. Hillyer and Short are cited in "Textile Soaps and Oils," by Hurst and Simmons, as having evolved such a method, but the writer has had no success with it.

Answer: We have inquired of several textile chemists who have had considerable experience with soap, and they tell us that to the best of their knowledge there is no sure way of determining the money value or essential qualifications of a soap except by making an analysis and comparing same against a known standard.

L. R. S.—*Question:* In the process of degumming silk, how is one to know when the gum is completely removed?

Answer: The only way that one can tell whether the silk is completely degummed is by its feel; no traces of any hardness in the silk can be felt when the gum is entirely removed. The silk should be given a hard boil with a neutral olive oil soap for at least one hour, and then several washings in hot water, the higher the temperature the better, so as to remove all traces of gum and soap. The silk should never be washed in cold water after being boiled, as the cold water will precipitate soap and gum on the fiber. If the silk is given a full hour boil and then properly washed all traces of gum should be removed.

J. L. M.—*Question:* Would you be kind enough to give me information on how to avoid yellow streaks when dyeing French or pearl grays on wool carpet yarns? The color combination I use is Alizarine Red and Blue, Yellow 2G and Wool Orange. The yarn is dyed in copper kettles.

Answer: There are many things which might cause this condition, and it is next to impossible to find the trouble without a personal investigation on the premises. However, a most likely cause is that the yarn has been imperfectly scoured and that some of the oil is left in it, which might readily account for the difficulty. Oftentimes, in using combinations of colors for the production of mode shades, colors are selected which do not work well together and it may be possible that this is true in your case. We could not say positively unless we knew of the particular types of the various colors which you are using. It would seem, however, that your colors are all right. Certain Wool Oranges sometimes give trouble, and it is possible that this may be the difficulty in your case. It would almost seem as though the Wool Orange might be eliminated entirely, as almost any shade of gray can be obtained by combining the other three colors.

For your more specific information we append a recipe which if carefully followed, and providing the yarn has been thoroughly scoured beforehand, ought to produce level and satisfactory results:

For pearl gray and other difficult mode combination shades on carpet yarns we recommend the following colors: Alizarine Rubinole GW, Alizarine Sapphire, Fast Light Yellow 2G, Wool Orange 2G Crystals.

The yarn should be entered into the dye bath prepared with the necessary amount of dyestuff, 20 per cent Glauber salt crystals and 2 per cent sulphuric acid at a temperature not exceeding 120 deg. Fahr. The temperature of the bath is then gradually raised to the boil and the bath is boiled for one-half hour. A further addition of 2 pounds sulphuric acid may then be commenced. This acid should be diluted with at least 1 gallon of cold water and the diluted acid fed in gradually with a dipper in different parts of the bath while constantly turning the yarn. The bath is then allowed to boil for one-half hour longer.

With this procedure no difficulty with streaks should develop.

Where dyeing is pushed too rapidly, the Alizarine Rubinole will set on first and is usually responsible for subsequent streakiness. The blue and orange are particularly level dyeing, and should not prove troublesome.

W. C. P.—*Question:* Will you kindly send us the specifications for a straight mineral oil to be used for wool stock? This oil is to be mixed by ourselves with animal or vegetable oils.

Answer: Ordinary specifications for an oil of this type ought to be approximately as follows: Gravity test 26 deg. Be., flash point 350 deg. Fahr., cold test (point at which oil hardens) 30 deg. Fahr., viscosity 100 at 100 deg. Fahr.

As a matter of fact, specifications of this sort mean very little in selecting a proper wool stock oil. The fundamental purpose for which wool oil is designed is to lubricate the strands of wool during the process of spinning and manufacture into cloth. This is made necessary because the animal oil originally contained in the wool has been removed through the process of scouring, in which process the introduction of strong alkali substances have performed a twofold function—that of cleansing the wool but at the same time removing the much desired animal oil. To replenish this lubricant the mineral oil is introduced in an emulsified form which facilitates its removal after the fabric is spun into cloth. If the mineral oil used has not been properly processed and the "bloom" has not been removed the likelihood of the entire removal of the oil in washing subsequent to weaving would be rather remote and stains and streaks would be likely to remain in the fabric.

For this reason wool stock oil is treated in one of two manners. Either chemically which, incidentally, is an inferior process because of the fact that chemicals used in the treatment may not be entirely removed from the finished oil, or by the "bleaching" process which is really nothing more than the exposure of the wool stock oil which, when manufactured from paraffin base is first filtered through fuller's earth and then exposed to the elements for a period of six months or more.

These two processes do not materially affect the physical tests of the oil and it might be possible for a person not thoroughly familiar with the requisites of proper wool oils to purchase on physical tests only and obtain an oil from which the "bloom" had not been removed or one which had been chemically treated and which would in either case be inferior to properly refined wool stock.

As an example, one might have two samples of wool stock, the first of which showed a gravity test of 26 deg. Be., flash 350 deg. Fahr., cold test 30 deg. Fahr., and viscosity 100 at 100 deg. Fahr., and another which showed gravity 27 deg. Be., flash 355 deg. Fahr., cold test 32 deg. Fahr., and viscosity 100 at 100 deg. Fahr., which on paper are practically identical. Yet the first of these might be an oil which had been first filtered and then debloomed through the sun bleaching method, and the latter one which is technically termed "a treated oil," which means that it has had carbonaceous matter removed through the introduction of sulphuric acid and a neutralizing reagent, such as caustic soda. As stated above, these two oils would be superficially identical yet as a wool stock they are diametrically opposite; one being practically worthless and the other being a thoroughly proper oil for the purpose for which it is intended.

These facts should be borne in mind when making purchases of wool stock oil and every effort made to insure your getting a proper oil. The best means to this end which we know of is to deal with a concern which specializes in this product and in whose reliability you have absolute confidence. As a general proposition I believe that it is difficult for a textile concern to make a properly emulsifying wool oil by the use of the straight mineral oil wool stock. If everything happens to work just right and the subsequent scouring operations are carried on at the proper temperature and with just the right soap results may be satisfactory but there are so many elements that require careful watching that the chances of continued success are comparatively small.

Recent Patents

Process for Production of Permanent Effects in Cotton Fabrics

U. S. 1,439,512; December 19, 1922. Georges Heberlein, Wattwil, Switzerland, assignor to Heberlein Patent Corporation, New York, N. Y.

A method of treating cotton fabric to produce a fabric in which the fibers have been chemically structurally altered to give to the fabric an all over transparent effect which is permanent, which method comprises subjecting the fabric to two chemical treatments, one a treatment with caustic alkali which will chemically structurally change the fabric, and the other a treatment with concentrated sulphuric acid which will differently chemically structurally change the fibers without seriously impairing the strength or flexibility of the fabric to produce in conjunction with said other treatment said transparent effect, the fabric being subjected to one of said treatment after the other and after the acid treatment washing the fabric.

Process of Treating Cotton Fabric to Produce Wool-Like Effects

U. S. 1,439,513; December 19, 1922. Georges Heberlein, Wattwil, Switzerland, assignor to Heberlein Patent Corporation, New York, N. Y.

This is a method of treating cotton fabric to produce the described wool-like effect, which method comprises subjecting the fabric to the action of concentrated sulphuric acid of from 49 to 51 deg. Be., then washing the fabric and subjecting it to the action of caustic soda without stretching the fabric.

Process for Production of Permanent Effects in Cotton Fabrics

U. S. 1,439,514; December 19, 1922. Georges Heberlein, Wattwil, Switzerland, assignor to Heberlein Patent Corporation, New York, N. Y.

A step in the method of treating cotton fabric to chemically structurally change the fabric so as to produce a wool-like effect, which step consists in subjecting the fabric to a treatment with a suitable concentrated mineral acid which will chemically structurally change the fibers of the fabric without seriously impairing the strength or flexibility of the fabric, so that said wool-like effect may be produced.

Process for Production of Permanent Effects in Cotton Fabrics

U. S. 1,439,515; December 19, 1922. Georges Heberlein, Wattwil, Switzerland, assignor to Heberlein Patent Corporation, New York, N. Y.

A method of treating cotton fabric to produce a fabric in which the fibers have been chemically structurally altered to give to the fabric a different and pleasing appearance which is permanent, which method comprises subjecting the fabric to two chemical treatments, one a mercerizing treatment and the other a treatment with nitric acid of about 43 to 46 deg. Be., the fabric being subjected to one of said treatments after the other, and after the acid treatment washing the fabric.

Process for Production of Permanent Effects in Cotton Fabrics

U. S. 1,439,516; December 19, 1922. Georges Heberlein, Wattwil, Switzerland, assignor to Herberlein Patent Corporation, New York, N. Y.

A method of treating cotton fabric to produce a fabric in which the fibers have been chemically structurally altered to give to the fabric a different and pleasing appearance which is permanent, which method comprises subjecting the fabric to two chemical treatments, one a mercerizing treatment and the other a treatment with zinc chloride solution of about 66 deg. Be. at high temperature, the fabric being subjected to one of said treatments after the other, and after the treatment with said zinc chloride solution washing the fabric.

Cotton Fiber, and Process of Making Same

U. S. 1,439,517; December 19, 1922. Eduard Heberlein, Wattwil, Switzerland.

Describes a process of treating cotton goods, which comprises treating the cotton goods with a "group of treatments with caustic alkali."

Also a process of treating thin cotton goods to produce a transparent and lustrous effect, which comprises subjecting the goods to a plurality of chemical treatments, including a "group of treatments with caustic alkali" and a treatment with concentrated sulphuric acid, applying said "group of alkali treatments" on the one hand and said acid treatment on the other hand alternately and repeatedly in such manner that at least one takes place between two of the others.

Process of Treating Cotton Fabric to Produce Wool-Like Effects

U. S. 1,439,518; December 19, 1922. Georges Heberlein, Wattwil, Switzerland, assignor to Heberlein Patent Corporation, New York, N. Y.

The method of treating cotton fabric to produce the described wool-like effect, which method comprises subjecting the fabric to the action of a cellulose solubilizing salt which will so alter the fiber that when the fabric is subsequently treated with caustic soda without stretching, the said wool-like quality will be effected, and thereafter treating the fabric with caustic soda without stretching it.

Cotton Goods with Linen-Like Effect, and Process of Producing Said Effect

U. S. 1,439,519; December 19, 1922. Eduard Heberlein, Wattwil, Switzerland.

A process for producing permanent linen-like effects in cotton goods, which comprises taking for treatment cotton goods (yarns and webs) constituted of threads whose fineness does not exceed English yarn No. 80, and subjecting the goods to a plurality of chemical treatments, one a treatment with caustic soda of at least 15 deg. Be. at a temperature below 0 deg. Cent., and another a treatment with concentrated sulphuric acid.

Process of Manufacturing Artificial Silk and Other Products from Nitrocellulose

U. S. 1,441,203; January 9, 1923. Emile Bindschedler, Philadelphia, Pa., and George Juer, Hopewell, Va., assignors to Tubize Artificial Silk Company of America, Wilmington, Del.

Recites the method of manufacturing clear, unclouded products from nitrocellulose which consists

in dehydrating nitrocellulose hydrate by treating it with ethyl alcohol, dissolving it, while still containing adhering ethyl alcohol, in a solvent made up in whole or in part of dry acetone or its homologues, giving to the collodion thus obtained the desired form and finally extracting the solvent by evaporation in warm dry air containing not to exceed 50 per cent moisture.

Process of Manufacturing Artificial Silk and Other Products from Nitrocellulose

U. S. 1,441,204; January 9, 1923. Emile Bindschedler, Philadelphia, Pa., and George Juer, Hopewell, Va., assignors to Tubize Artificial Silk Company of America, Wilmington, Del.

Sets forth the method of manufacturing clear unclouded products from nitrocellulose which consists in dissolving the nitrocellulose in a solvent made up in whole or in part of acetone or its homologues, imparting to the acetone collodion thus formed the desired form and extracting the solvent by immersing the formed product in a liquid which is mixable with acetone and in which nitrocellulose is insoluble.

Process of Manufacturing Artificial Silk and Other Products from Nitrocellulose

U. S. 1,441,205; January 9, 1923. Emile Bindschedler, Philadelphia, Pa., and George Juer, Hopewell, Va., assignors to Tubize Artificial Silk Company of America, Wilmington, Del.

The method of manufacturing clear unclouded products from nitrocellulose which consists in dissolving the nitrocellulose in a solvent made up in whole or in part of acetone or its homologues, imparting to the acetone collodion thus formed the desired form and extracting the solvent by immersing the formed product in a concentrated solution with which acetone will chemically react but which will not affect nitrocellulose.

H. S. BUSBY OPENS NEW YORK OFFICE AS CONSULTING COLORIST

Announcement has been made by Hibbard S. Busby, consulting colorist, of the establishment by him of a service for the solution of color problems. He will likewise bring an expert training and experience to bear on problems pertaining to quality, quality of finish, and physical properties of materials; standardization of manufacturing processes; drafting of specifications, inspection, classification, registration of production against established standards of color measurement. His office is at 101 Park Avenue, New York City.

Mr. Busby was formerly connected with Cheny Brothers in a similar capacity, and is well known as an active members of the American Association of Textile Chemists and Colorists, to which he has already contributed a number of talks and original papers.

NINETEENTH KNITTING ARTS EXPOSITION EXPECTED TO BE RECORD-BREAKER

The Nineteenth Annual Knitting Arts Exhibition, to be held in the Commercial Museum, Philadelphia, April 2 to 5, gives every indication of a record-breaking gathering. The exhibition will be under the National Association of Hosiery and Underwear Manufacturers, and will be attended by knit goods manufacturers from all parts of the country. Inasmuch as the annual convention of the National Association will be held at the same time, there is every reason to predict that the show week will be a busy one for Philadelphia.

The list of firms which will display their machinery and products will include the leaders of all lines in any way allied to the knitting industry. To date the number of spaces indicates a more comprehensive display of knitting machinery and appliances than has ever been shown before in this country. In addition, there will be displays by yarn and raw material firms, dyers, finishers, supply manufacturers, together with a long list of concerns whose products are used in the industry.

As usual, much of the equipment on display will be in actual operation, and as there has been considerable development the past year great interest will be shown in these features, which are of great educational importance.

The exhibition will be under the personal direction of Chester I. Campbell, of Boston, whose reputation as an exposition manager has been made in scores of successful events during the last twenty years. Every detail of the exhibition will be under his eyes and the staff workers of the Campbell organization.

WANTED—Copies of the February 12, 1923, issue of AMERICAN DYESTUFF REPORTER. Owing to extra demand, our file copies of Vol. XII, No. 4, issue of February 12, 1923, have been exhausted. Anyone willing to part with one or more copies will confer a favor by addressing this office. AMERICAN DYESTUFF REPORTER, 4109 Woolworth Building, New York City.

EXPERIENCED SILK DYER WANTED

Wanted—Experienced silk dyer to take position as assistant in a piece dyeing establishment which produces a varied line of all-silk, silk and wool, and silk and cotton fabrics. Also an experienced silk skein dyer. In making application please state fully age, education, previous employments, nationality, and salary required to accept position. No one without silk dyeing experience need apply. Address Box 224, care of the American Dyestuff Reporter.

A Canadian woolen mill manufacturing a wide range of dress goods and coatings, piece dyed and raw stock, has an opening for a young man of ability to take charge of dyeing operations under expert supervision.

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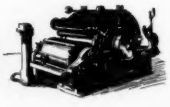

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